The New Psychology in the Modern University: James McKeen Cattell and William Pepper at the University of Pennsylvania, 1880–1891

ABSTRACT: As provost, William Pepper sought to transform the University of Pennsylvania into a "modern university" in the 1880s. He appointed James McKeen Cattell, who had studied experimental psychology at the University of Leipzig, as one of America's first professors of this emerging laboratory-based science. This article analyzes the course of events that led to this appointment, Cattell's own experimental achievements while in Philadelphia, and, finally, the reasons for his 1891 move to Columbia University. In doing so, it illustrates how and suggests why Pepper's reform efforts remained only partially realized.

IN 1888, THE UNIVERSITY OF PENNSYLVANIA appointed James McKeen Cattell as one of America's first professors of the new science of experimental psychology.[1] In implementing his pioneering position in

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Two younger friends—Jonathan Knapp and Emily Handlin—deserve special thanks. Jon has long known of my interest in Cattell. Some time ago, his girlfriend, Emily—an art historian writing on Eadweard Muybridge—happened to mention that her subject had links with the University of Pennsylvania that seemed to parallel those of a scientist she had never heard of named James McKeen Cattell. Jon immediately put two and two together, and this article certainly reflects all I soon learned from Emily. I hope she found our talks just as profitable.

In any case, I must accept sole responsibility for all remaining errors of detail, logic, and presentation.

[1] William Pepper, *Report of the Provost of the University of Pennsylvania for the Two Years Ending October 1, 1889* (Philadelphia, 1890), 16, 18, and also http://www.archives.upenn.edu/primdocs/upi

Philadelphia, Cattell did much to establish the scientific status of his discipline.[2] More personally, he initiated an ambitious research program that highlighted this status in the eyes of other Americans. It also enhanced his own reputation—confirmed in 1901, when he became the first psychologist elected to the National Academy of Sciences—as one of the most highly respected Americans in his field.[3] Cattell's initial appointment, however, did not derive solely from his scientific stature. It embodied, instead, one aspect of the University of Pennsylvania's ambitious efforts to transform itself. Led by its chief executive, provost William Pepper, to create what would later be called a "Modern University," these efforts fostered "researches and original investigations . . . [as] an important part of its work."[4] In encouraging such work, Pepper hoped to help his alma mater catch up with developments at other major American universities and reinstate his university as one of America's leading institutions of higher education.

It was the confluence of the careers of these two men—one hoping to promote his science and the other working to rebuild his university—that had such a major impact on the science of psychology and the University of Pennsylvania. Cattell's and Pepper's efforts reinforced each other and did much to implement their broader ambitious goals for American science and American higher education.

Charles Stillé, William Pepper, and University Transformation in Philadelphia

William Pepper's ambition stemmed largely from his identity as a Philadelphian and from his pride in his university. Born in 1843, he had graduated from the University of Pennsylvania's college in 1862

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[2] For overviews of Cattell's life and career, see Michael M. Sokal, "James McKeen Cattell," in *American National Biography*, ed. John A. Garraty and Marc C. Carnes, 24 vols. (New York, 1999), 4:584–86; Michael M. Sokal, "James McKeen Cattell," in *Complete Dictionary of Scientific Biography*, 26 vols. (Detroit, 2008), 20:73–74.

[3] Michael M. Sokal, "William James and the National Academy of Sciences," *William James Studies* 5 (2010): 29–38.

[4] William Pepper, "Notes," in *Animal Locomotion: The Muybridge Work at the University of Pennsylvania. The Method and the Result* (Philadelphia, 1888), 5, as quoted in Sarah Gordon, "Prestige, Professionalism, and the Paradox of Eadweard Muybridge's *Animal Locomotion* Nudes," *Pennsylvania Magazine of History and Biography* 130 (2006): 79–104; quotation on 100–101.

and from its medical school in 1864, where he then taught for many years before becoming provost in 1880. He had high hopes for the university's future. In particular, Pepper sought to have the University of Pennsylvania regain its place among the nation's leading institutions of higher learning just as the American university system began revolutionizing itself.[5]

In the decades following the Civil War, many American universities, both private and those supported by the state, came to resemble those in Germany, which emphasized graduate education and faculty scholarship more than did the many religiously affiliated colleges in America. Often led by dynamic and charismatic presidents, the era's newly founded, "modern" universities included Cornell (1865; President Andrew Dickson White), Johns Hopkins (1876; Daniel Coit Gilman), Clark (1887; G. Stanley Hall), Stanford (1891; David Starr Jordan), and the University of Chicago (1892; William Rainey Harper). Meanwhile, several older universities—including Harvard (led since 1869 by the especially forceful Charles William Eliot) and the universities of Michigan and Wisconsin, among others—also transformed themselves.

Pepper's efforts actually preceded those of many of his contemporaries, though a later observer described his style as "less conspicuous" than theirs.[6] In promoting reform at the University of Pennsylvania, he built upon the precedent set by his immediate predecessor, Charles Janeway Stillé. As early as his first year as provost—that is, in 1870, six years before the founding of Johns Hopkins—Stillé began implementing (or at least trying to implement) curricular reform, beginning with the teaching of modern European languages in addition to the university's traditional emphasis on classical Greek and Latin. In doing so, however, he apparently alienated the institution's trustees, who, he had been warned, "lack[ed] sympathy with any initiative stemming from the faculty" or even from the

[5] David Y. Cooper, "William Pepper," in Garraty and Carnes, *American National Biography*, 17:314–16; Edward P. Cheney, *History of the University of Pennsylvania* (Philadelphia, 1940), 296–97. See also Edward A. Skuchas, "Biographical Note," in "A Guide to the Office of the Provost Records, William Pepper Administration, 1887–1892" (finding aid), University Archives and Records Center, University of Pennsylvania, Philadelphia, PA (2002), accessed Feb. 3, 2015, http://www.archives.upenn.edu/faids/upa/upa6/upa6_2pep_guide.pdf. The best overview of this revolution remains Laurence R. Veysey, *The Emergence of the American University* (Chicago, 1965). For an almost contemporaneous view, see Edwin E. Slosson, *Great American Universities* (New York, 1910). A just-published analysis is Roger L. Geiger, *The History of American Higher Education: Learning and Culture from the Founding to World War II* (Princeton, NJ, 2015).

[6] Veysey, *Emergence of the American University*, 305–6.

provost.[7] As Stillé's title as provost (instead of president) might suggest, these trustees remained committed to close oversight of their chief executive, limiting his freedom. They resented his attempts to assume "actual executive power" and voted against all reforms. To be sure, later observers noted that Stillé's "personal style" apparently cost him friends. In addition, through these years (and even into the twentieth century), the university faced significant financial limitations that other contemporaneous institutions escaped. While Cornell and Johns Hopkins had their namesakes, the University of Chicago had John D. Rockefeller, and Columbia had rich New York families, the University of Pennsylvania's trustees usually earmarked their generosity for pet projects. Archetypically, in 1881 Joseph Wharton endowed the creation of the practically oriented School of Finance and Commerce that bears his name. Stillé left the provostship in 1880 without having achieved his goals. But he had succeeded in setting the university on a new course.[8]

Stillé's departure paved the way for Pepper's ascension. The university's trustees seemed initially to have trusted in his leadership more than they had his predecessor's, granting him the kinds of "executive powers" they had denied Stillé. Stillé claimed that Pepper had made such changes "an indispensable condition" of his accepting the office, and Pepper readily took advantage of them.[9] He revealed the extent of his ambitions in a statement quoted years later by another contemporaneous university chief executive, President Charles Franklin Thwing of Western Reserve: "After the days of Benjamin Franklin the University went to sleep. It slept in peace till I came one hundred years after. When I came it woke up."[10]

Like many of his academic contemporaries, Pepper believed that

[7] On the attitudes and influence of the university's trustees, see E. Digby Baltzell, *Puritan Boston and Quaker Philadelphia: Two Protestant Ethics and the Spirit of Class Authority and Leadership* (New York, 1979), 246–68. More specifically, see Martin Meyerson and Dilys Pegler Winegrad, *Gladly Learn and Gladly Teach: Franklin and His Heirs at the University of Pennsylvania, 1740–1976* (Philadelphia, 1978), especially chap. 9, "Charles Janeway Stillé and William Pepper: Creating the Modern University," 101–15, 247; quotation on 104.

[8] Meyerson and Winegrad, *Gladly Learn and Gladly Teach*, 105.

[9] Ibid., 105–6.

[10] Charles Franklin Thwing, "William Pepper," in *Friends of Men* (New York, 1933), as quoted in Meyerson and Winegrad, *Gladly Learn and Gladly Teach*, 10, 247. In 1895, a University of Pennsylvania historian wrote of Pepper's "remarkable awakening" of the institution "after a sluggish life of almost a century." See Franklin N. Thorpe, "The University of Pennsylvania," *Harper's New Monthly Magazine* 91 (1895): 285–303; quotation on 292.

> the function of a [fully awake and modern] university is not limited to the mere instruction of students. Researches and original investigations conducted by mature scholars composing its faculties are an important part of its work, and in a larger conception of its duty should be included the aid which it can extend to investigators engaged in researches too costly or elaborate to be accomplished by private means.[11]

Pepper devoted his time as provost to implementing this vision for the University of Pennsylvania. For example, under his leadership the university instituted an unusual (and perhaps unique) mechanism to promote such "original investigations": a series of "commissions" designed to oversee "costly researches" by "individual investigators" or on a particular topic. Perhaps the best known and most successful of these was the "Muybridge Commission," established in 1883, to sponsor Eadweard Muybridge's photographic studies of animal and human locomotion. The photographer had long sought—and failed—to win support from other American universities. Pepper convinced Philadelphia publisher J. B. Lippincott to cover initial expenses and, eventually, to publish the results of Muybridge's work. When it appeared in 1887, Muybridge's *Animal Locomotion: An Electro-Photographic Investigation of Consecutive Phases of Animal Movements, 1872–1885* was soon recognized as an epoch-making artistic and technological achievement.[12]

Another commission—one more relevant to the history of psychology in Philadelphia—emerged in 1883. In that year, the will of Henry Seybert, a chemist and scion of an eminent local family, endowed a chair of philosophy at the university on the condition that it also appoint a commission to investigate "all systems of Morals, Religion, or Philosophy which assume to represent the Truth, and particularly of Modern Spiritualism."[13] In the 1880s, many educated Americans looked to what later observers called psychical research and parapsychology as an adjunct or an alternative to more traditional Christian beliefs shaken by Darwinian ideas; few saw Seybert's request as

[11] Pepper, "Notes," as quoted in Sarah Gordon, "Prestige, Professionalism, and the Paradox of Eadweard Muybridge's *Animal Locomotion* Nudes," 100–101. See also University Archives and Records Center, "Muybridge's *Animal Locomotion* Study: The Role of the University of Pennsylvania," accessed Feb. 3, 2015, http://www.archives.upenn.edu/histy/features/muybridge/muybridge.html; and Meyerson and Winegrad, *Gladly Learn and Gladly Teach*, 111.

[12] See Gordon, "Prestige, Professionalism, and the Paradox."

[13] Moncure Robinson, "Obituary Notice of Henry Seybert," *Proceedings of the American Philosophical Society* 21 (1883): 241–63.

beyond the pale.[14] That said, most scientifically informed scholars of the era never accepted spiritualism. With few exceptions (such as quasibeliever William James), most viewed spiritualist mediums as, at best, self-deluded naïfs or, at worst, frauds. Nonetheless, through the mid-1880s, members of the university's Seybert Commission—including such eminent scientists as paleontologist Joseph Leidy and neurologist S. Weir Mitchell—attended séances and consulted magicians who duplicated the mediums' results using traditional sleight of hand. In 1887, the commission published its *Preliminary Report*, which (despite its title) was its only publication. It refuted the claims of all the spiritualists it had investigated and helped set the stage for later debunking studies.[15]

In addition to Pepper's support for such work, he followed more traditional patterns in his efforts to have the University of Pennsylvania evolve into a "Modern University" that fostered scholarship. Most notably, in 1882 he established a graduate school for the university, the Faculty of Philosophy, whose title echoed German university practice.[16] As he wrote in his "Report of the Provost" for 1883, "one of the most important functions of a University is to provide every possible accommodation for students . . . pursuing their investigations beyond . . . the college curriculum."[17]

Such postcollegiate studies required a large cohort of active scholars actively pursuing their own researches. The university's initial Faculty of Philosophy comprised fifteen longstanding professors, including such eminent researchers as physicist George F. Barker, mathematician Ezra Otis Kendall, and paleontologist Joseph Leidy.[18] But Pepper knew he had to recruit fresh faces for the new school.

As he did so, his successive annual reports of the provost between 1883 and 1889 listed at least fifteen new Faculty of Philosophy professors whose notable

[14] Robert Laurence Moore, *In Search of White Crows: Spiritualism, Parapsychology, and American Culture* (New York, 1977).

[15] Cheney, *History*, 319; William Pepper et al., *Preliminary Report of the Commission Appointed by the University of Pennsylvania to Investigate Modern Spiritualism* (Philadelphia, 1887); S. M. Lindsay, "The Seybert Commission," *Pennsylvanian* 3 (1887–88): 59–60; Joseph Jastrow, "The Psychology of Spiritualism," *Popular Science Monthly* 34 (1884): 721–32; "The Seybert Commission," *New York Times*, June 13, 1887.

[16] Nineteenth-century German academics understood philosophy as encompassing all learning except the professional practices taught in faculties of medicine, law, and theology. Just as these faculties awarded MDs and JDs, German faculties of philosophy awarded PhDs. See James Morgan Hart, *German Universities: A Narrative of Personal Experience* (New York, 1874).

[17] William Pepper, "Report of the Provost," in *Annual Reports of the Provost and Treasurer of the University of Pennsylvania for the Year Ending October 1, 1883* (Philadelphia, 1883), 37, and also http://www.archives.upenn.edu/primdocs/upi/upi25_2/upi25_2_1882_1883.pdf.

[18] Clark A. Elliott, *Biographical Dictionary of American Science: The Seventeenth through the Nineteenth Centuries* (Westport, CT, 1979), 23 (Barker), 145 (Kendall), 165 (Leidy).

fields of research included astronomy, chemistry, biology, political economy, Arabic and rabbinical literature, and American archaeology and linguistics. Several had earned PhDs at the Universities of Göttingen, Halle, and Leipzig or MDs at Philadelphia medical schools. At least two—Semiticist Morris Jastrow Jr. and chemist Edgar Fahs Smith—had long and distinguished careers at the University of Pennsylvania and had built programs whose national and international reputations continued well into the twentieth century.[19] Each embodied the kind of active researcher that Pepper had in mind as he created the Pennsylvania Faculty of Philosophy.

Pepper also knew that he had to supplant some of the university's long-serving professors who lacked such scholarly interests. Fortunately for this goal, longtime professor of moral and intellectual philosophy Charles Porterfield Krauth died in January 1883, even before the Seybert bequest took effect. Krauth had held his chair since 1868, and Pepper's 1883 report of the provost includes a tribute to his long service. But Krauth had been well known for his strongly reactionary attitudes and, unlike occupants of similar chairs at other institutions, who wrote influential books on mental philosophy, he slighted the psychological in his teaching. Instead, he stressed the moral and played a major role in systematizing American conservative Lutheran theology.[20] Pepper saw Krauth's death as an opportunity to build the university's reputation in psychology, a subject that had just recently begun to emerge as a science and was beginning to attract national and international attention.

The Emergence of the New Psychology

Of course, mental philosophers had been asking psychological questions for centuries. What (and how) do our senses tell us about our world? How do we learn? What *is* the mind, and how does it work? As laboratory sciences expanded, German scientists of the early and mid-nineteenth century such as Ernst Heinrich Weber, Hermann von Helmholtz, and Gustav Theodor Fechner developed laboratory-based

[19] Harold S. Wechsler, "Morris Jastrow," in Garraty and Carnes, *American National Biography*, 11:886–87; Wyndham D. Miles, "Edgar Fahs Smith," in *Complete Dictionary of Scientific Biography*, 12:465; George B. Kaufman, "Edgar Fahs Smith," in Garraty and Carnes, *American National Biography*, 20:161–62.

[20] Pepper, "Report of the Provost," in *Annual Reports of the Provost and Treasurer . . . 1883*, 3–4; James D. Bratt, "Charles Porterfield Krauth," in Garraty and Carnes, *American National Biography*, 12:910–11; Cheney, *History*, 296–97.

research programs to attack these problems and, in doing so, created what soon became widely known as the "new psychology."[21]

Among the best known of these programs was experimental psychophysics, which claimed that mental sensations could be measured and that their magnitudes had determinable quantitative relationships with the intensities of the specific physical stimuli that caused them. Another focused on reaction time determinations, as these scientists believed they could measure how long it took the human mind to perform specific mental acts.[22] Mid-nineteenth-century German universities, which stressed scientific and scholarly research more than any other at the time, proved fertile ground for the evolution of these programs into the science of experimental psychology.

The scientific achievements of one man in particular, Wilhelm Wundt of the University of Leipzig, did more than any contemporaneous work to promote this new field.[23] By 1879, Wundt had established a psychological laboratory that soon achieved official university recognition. Through the 1880s he attracted hundreds of students from around the world. News of these exciting developments soon reached America; most American mental philosophy textbooks of the era at least mentioned them.[24] In 1882, Pepper and other Pennsylvanians hoped to move at least segments of the university's philosophy teaching in the direction of the new psychology, especially if such instruction would also involve "researches and original investigations."

The Education and Promotion of James McKeen Cattell

Among the other Pennsylvania academics to also try to promote these changes was William C. Cattell, president of Lafayette College in Easton, Pennsylvania, about seventy miles north of Philadelphia. He had personal reasons to do so, for his then twenty-two-year-old son, James McKeen Cattell, had just decided to seek an academic career in the new psychol-

[21] The richest account of these developments remains Kurt Danziger, *Constructing the Subject: Historical Origins of Psychological Research* (Cambridge, UK, 1990).

[22] Contemporaneous reaction-time experiments excited public attention. Professor Redwood, the protagonist of H. G. Wells's novel *The Food of the Gods and How It Came to Earth* (London, 1904), achieved his scientific eminence through his "voluminous work on Reaction Times."

[23] Danziger, *Constructing the Subject*, 34, 48. See also Wolfgang G. Bringmann and Ryan D. Tweney, eds., *Wundt Studies: A Centennial Collection* (Toronto, 1980).

[24] See Hart, *German Universities*.

ogy.[25] Born in 1860, the younger Cattell had grown to maturity in an upper-middle-class home within the warmth of a close and loving family. Though others might have found such a closeness stifling, Cattell thrived in this setting, and for the rest of his life he consciously sought to recreate this family-centered life with his wife and their children. He had graduated with high honors from Lafayette less than three years earlier and had spent two years studying at German universities. Although Cattell spent some time with Wundt at Leipzig, Herman Lotze's lectures at Göttingen especially impressed him, and he focused his scholarly attention on Lotze's attempts to reconcile the results of scientific investigations with philosophical and psychological concerns: what Cattell called (in an 1882 essay) "the world of fact and the world of value."[26]

In the fall of 1882, Cattell returned to America to assume a fellowship in philosophy at Johns Hopkins.[27] In Baltimore, he attended seminars on the history of philosophy but also began working in H. Newell Martin's physiological laboratory, ambitiously seeking to learn more about the physiological "world of fact" on which the psychological "world of value" rested. Like many of his classmates, Cattell also began taking psychoactive drugs—hashish, morphine, and opium, among others—and in doing so stirred his interest in psychological responses to physiological change. As he noted in October 1882, after his first experience with hashish, "I seemed to be two persons one of which could observe and even experiment on the other."[28] Less than four months later, soon after Krauth's death (and perhaps at his father's suggestion), Cattell wrote that he would "save up" his earlier philosophical studies and "go to work on physiological psychology."[29] He thus began his work as a psychologist under the influence of drugs, and though his father never knew the reasons for his son's career choice, William Cattell did all he could to foster it.

[25] Michael M. Sokal, ed., *An Education in Psychology: James McKeen Cattell's Journal and Letters from Germany and England, 1880–1888* (Cambridge, MA, 1981).

[26] James McKeen Cattell, "Untitled Essay on the Philosophy of Herman Lotze," Cattell Papers. See also Michael M. Sokal, "Launching a Career in Psychology with Achievement and Arrogance: James McKeen Cattell at the Johns Hopkins University, 1882–1883," *Journal of the History of the Behavioral Sciences* (in press).

[27] Sokal, *An Education in Psychology*, 47–82.

[28] James McKeen Cattell, Student Journal, entry for Oct. 5, 1882, Cattell Papers; Sokal, *An Education in Psychology*, 50–51.

[29] James McKeen Cattell, Student Journal, entry for Jan. 21, 1883, Cattell Papers; Sokal, *An Education in Psychology*, 61.

Within a week of Krauth's death, the older Cattell began lobbying for his son's appointment at the University of Pennsylvania and soon met twice with Pepper. Knowing the great influence of the university's trustees, he also called on Frederick Fraley, a Philadelphia merchant and the board's president.[30] Despite William Cattell's actions, the university soon appointed George S. Fullerton, one of its own alumni, as instructor of moral and intellectual philosophy.[31] Though only one year older than James Cattell and more interested in the psychological aspects of his philosophical studies than Krauth had ever been, Fullerton was equally concerned with religious philosophy and was soon ordained an Episcopal priest.[32] Nonetheless, through the mid-1880s he did much to stimulate his students' interests in the new psychology by using Lotze's *Outlines of Psychology* as a textbook. He had also played a major role in the Seybert Commission on spiritualism, serving formally as its secretary. And once the commission denounced those whom it had studied, Pepper and Fullerton managed to convince the university trustees that the new science, based in experimentation, provided a modern alternative both to spiritualism and to traditional psychology, rooted in philosophy.[33]

Meanwhile, William Cattell continued his campaign. By September 1886 James McKeen Cattell had earned a German PhD for experimental research in the new psychology. That month both Pepper and board president Fraley recommended the appointment of the younger Cattell as lecturer in psychophysics, drawing his salary from the remnant of the Seybert bequest.[34] For Pepper, the appointment represented a major step

[30] Elizabeth McKeen Cattell to James McKeen Cattell, Jan. 8, 1883, and William C. Cattell to James McKeen Cattell, Jan. 18, 1883, Cattell Papers; Sokal, *An Education in Psychology*, 57, 59–61.

[31] William Pepper, "Report of the Provost," in *Annual Reports of Provost and Treasurer of the University of Pennsylvania for the Year Ending October 1, 1885* (Philadelphia, 1886), 33, 35, and also http://www.archives.upenn.edu/primdocs/upi/upi25_2/upi25_2_1883_1885.pdf. Elizabeth McKeen Cattell to James McKeen Cattell, Jan. 22, 1883, and William C. Cattell to James McKeen Cattell, Jan. 18, 1883, Cattell Papers.

[32] "George Stuart Fullerton," in *Dictionary of American Biography*, 20 vols. (New York, 1928–36), 7:66–67; Cheney, *History*, 297, 336; Dickinson S. Miller, "Fullerton and Philosophy," *New Republic* 42 (1925): 310–12; University of Pennsylvania, *Catalogue and Announcements, 1887–88* (Philadelphia, 1887), 19, and also http://www.archives.upenn.edu/primdocs/upl/upl1/upl1_1887_88.pdf.

[33] See William C. Cattell to James McKeen Cattell, Apr. 12, 1883, Cattell Papers; Sokal, *An Education in Psychology*, 73.

[34] William C. Cattell to William Pepper, Sept. 28, 1886, enclosing Wilhelm Wundt to William C. Cattell, Apr. 15, 1885 (in German, with attached English translation), University Archives and Records Center; William Pepper, *Annual Report of the Provost of the University of Pennsylvania, Including Reports of Departments and Abstract of the Treasurer's Report, for the Year Ending October 1, 1887* (Philadelphia, 1888), 6–7, 29, 31, 40–50, 97–98, and also http://www.archives.upenn.edu/primdocs/upi/upi25_2/upi25_2_1885_1887.pdf. See also Sokal, *An Education in Psychology*, 226–31.

in his campaign to build a research-oriented graduate school, and Cattell's research-based German PhD made him especially attractive. Pepper apparently chose "psycho-physics" as part of Cattell's title to emphasize the scientific basis of his approach to psychology.

Cattell had not been intellectually stagnant in the two-and-a-half years since Krauth's death. In Baltimore, he had completed a major series of reaction-time experiments that had observers identify letters and read words as quickly as possible. Later observers drew implications from Cattell's results for the teaching of reading, citing them to support whole-word (rather than phonics-based) methods.[35] Unfortunately, Johns Hopkins professor G. Stanley Hall tried to appropriate Cattell's results as his own, and the resultant clash contributed to Cattell's dismissal from Johns Hopkins in May 1883.[36]

Cattell then went to Leipzig, where he worked with Wundt and articulated the scientific ideology he had developed at Lafayette. In Easton, his warm upbringing and focus on the importance of family life, as well as his wide reading, had led him to the ethics of Auguste Comte's positivism, which stressed altruism as the basis of all ethical behavior, exemplified by the mother's sacrifice in childbirth.[37] Cattell's serious study of Comte's ethics for his senior thesis led him directly to a more prominent aspect of Comte's system, his positivist philosophy of science. This philosophy highlighted the authority of mathematics and precise quantification, and Cattell combined this focus with Francis Bacon's methodological and utilitarian prescriptions for science, which his Lafayette professors had emphasized. This scientific ideology stressed both the importance of collecting, without a hypothesis, vast quantities of observational and experimental detail, and the belief that all science must be ultimately useful.[38] As a result, through his earliest scientific work, Cattell set out to gather large amounts of highly precise quantitative data, even if he had no firm idea of their meaning and import.

[35] Sokal, *An Education in Psychology*, 64–82. Cattell reported the results of these experiments in James McKeen Cattell, "Über die Zeit der Erkennung und Benennung von Schriftzeichen, Bildern und Farben," *Philosophische Studien* 2 (1885): 635–50, translated by Robert S. Woodworth as "On the Time Required for Recognizing and Naming Letters and Words, Pictures and Colors," in *James McKeen Cattell: Man of Science*, ed. A. T. Poffenberger, 2 vols. (Lancaster, PA, 1948), 1:13–35. See also Edwin B. Huey, *The Psychology and Pedagogy of Reading* (New York, 1908), 71–75; and Eleanor J. Gibson and Harry Levin, *The Psychology of Reading* (Cambridge, MA, 1975), 189.

[36] Sokal, *An Education in Psychology*, 87–88, 110–12.

[37] See Giacomo Barzellotti, *The Ethics of Positivism: A Critical Study* (New York, 1878).

[38] Sokal, *An Education in Psychology*, 16–17; Michael M. Sokal, "Life-Span Developmental Psychology and the History of Science," in *Beyond History of Science: Essays in Honor of Robert E. Schofield*, ed. Elizabeth W. Garber (Bethlehem, PA, 1990), 67–80.

This understanding of science led him to extend his work with reaction times and to measure them more precisely than Wundt ever had. Cattell believed that his procedures allowed him to determine the duration of specific functional mental actions. For example, at Leipzig he measured how long it took a subject to identify a color, to read a word, to translate the word from one language to another, to remember in which language a particular author wrote, or to judge if that author was greater than Goethe. Throughout this work he ignored any theoretical implications that might have been drawn from his work, but he challenged many of Wundt's methodological assumptions. For example, although Wundt did not adopt the highly systematized and precisely defined introspective techniques later developed by others, he did rely upon a set of careful procedures he characterized as experimental self-observation. Cattell, however, never could introspect or even (in Wundt's terms) self-observe, and he never could employ even such a limited methodology. He thus quickly abandoned Wundt's methods to study the behavior of laboratory subjects under carefully controlled conditions.[39]

Cattell thus was the first psychological experimenter to formally differentiate between a subject and an observer. Through his later rhetorical pronouncements, the behavioral emphases of his experimental work became especially influential in the early twentieth century. Cattell had earned his PhD in March 1886 and had soon become Wundt's first formal assistant, a position that allowed him to enhance his experimental skills. He then went to England as a fellow-commoner of St. John's College, Cambridge, planning to study medicine and, perhaps, to seek a career in neurology that would parallel that of S. Weir Mitchell, the eminent Philadelphia physician and university trustee who had served on the Seybert Commission.[40]

Cattell and his ambitions thrived at Cambridge, and he enjoyed both the university's heady intellectual atmosphere and its rich social life. He reacted ambivalently to the initial news of his appointment in Pennsylvania. Although he felt gratified, he did not want to leave cosmopolitan Cambridge for what he saw as the relatively provincial city of Philadelphia. He put off his return to America for as long as he could,

[39] Michael M. Sokal, "Scientific Biography, Cognitive Deficits, and Laboratory Practice: James McKeen Cattell and Early American Experimental Psychology, 1880–1904," *Isis* 101 (2010): 531–54.

[40] Sokal, *An Education in Psychology*, 218–23. On Mitchell, see William F. Bynum, "Silas Weir Mitchell," in *Complete Dictionary of Scientific Biography*, 9:422–23; Dennis Wepman, "Silas Weir Mitchell," in Garraty and Carnes, *American National Biography*, 15:629–31; and Percival Bailey, "Silas Weir Mitchell," *Biographical Memoirs of the National Academy of Sciences* 32 (1958): 334–53.

finally arranging to begin his lectures in January 1888.[41] In the meantime, he became engaged to a young Englishwoman, Josephine Owen, whom he had met in Leipzig. Through their later life together, Josephine Owen Cattell did much to support her husband's scientific work, and he often praised her major role in his professional achievement.[42] Cattell also met regularly with Francis Galton, the London-based scientific polymath. In the 1870s, Galton had developed the concept of eugenics and, in the following decade, he sought scientific bases for this ideology. In 1883, he opened an anthropometric laboratory to collect data documenting the physical and physiological differences between individuals. From the start, he knew he would also have to measure psychological differences, and in 1885 he began corresponding with Cattell, who knew better than any other English-speaker just what Wundt's new experimental psychology entailed. These contacts helped Galton adapt his laboratory's procedures, and through the late 1880s visitors to the laboratory had their reaction times measured.[43]

More importantly for the evolution of American psychology, Cattell's dealings with Galton helped him refine his scientific interests. His earlier work with Wundt focused largely on technical matters. But under Galton's influence, his utilitarian concerns re-emerged, and he began to emphasize that the procedures he had learned in Germany could be used to measure individual differences. For Galton, these differences were the Darwinian variations that made natural selection possible and that allowed him to preach the gospel of eugenics. Cattell accepted this view completely, and unlike others at the time and later—who promoted the well-known practices of "negative" eugenics (including sterilization and immigration restriction)—Cattell both promoted and practiced "positive" eugenics. This ideology called for the "best" members of each generation to seek out and marry others who shared their positive traits and for each such couple to have as many children as practicable. Cattell believed that he and his wife represented superior members of the species, and this understanding meshed directly with his interests in forming a warm and loving family like the one he had grown up in. Over the next two decades, then, he and his wife eschewed birth control and had seven children.[44] Cattell's science

[41] Sokal, *An Education in Psychology*, 274–75.
[42] Ibid., 213, 267–68, 313, 327, 340–41.
[43] Ibid., 208, 214, 218, 222, 234, 261–62, 265, 297–300, 328.
[44] Ibid., 340–41.

and his personal life both continued to reflect the impact of Galton's ideas throughout the decades that followed.

When Cattell finally arrived at the University of Pennsylvania as lecturer in psychophysics, the modern university and the new psychology finally came together in a way that gratified Pepper. Cattell's first intellectual chore involved public lectures on his subject from January through March 1888; Pepper had arranged for many of the university's newly appointed faculty members to give such lectures on their research.[45] Cattell's attracted much attention from the *Pennsylvanian*, the university's student newspaper, which editorialized on his lectures' importance, and even from the *Philadelphia Public Ledger*, which reported on each. In these lectures, Cattell differentiated the new psychology from both spiritualism and "distinctly metaphysical subjects." He emphasized "what can be learned by the methods of exact and experimental science concerning the mind and its relation to the external world" and stressed the importance of precise quantification.[46] These lectures proved intellectually successful and gratified Pepper. Cattell returned to Cambridge in April 1888, and, in the months that followed, Pepper worked to appoint him professor of experimental psychology—a title that highlighted the scientific nature of his work—and a salary of $1,000.[47] He also urged Cattell's father to raise funds to support an experimental laboratory for psychology. By January 1889, when James McKeen Cattell assumed his chair, the senior Cattell had raised almost $2,000. Cattell himself gave $100, and trustee Frederick Fraley, instructor George S. Fullerton, and professor S. Weir Mitchell each gave $50. Pepper himself gave $250, a donation that illustrates his belief in Cattell's program.[48] Cattell opened his laboratory soon afterward, thus embodying Pepper's goals for his university. To be sure, Cattell was seventeen years younger than Pepper—a significant gap for a young man in his mid-to-late twenties—and (as noted) he was one of sev-

[45] Pepper, *Annual Report of the Provost . . . 1887*, 55–56.

[46] James McKeen Cattell, draft lecture outlines, Cattell Papers; J. Duncan E. Spaeth, "Editorial," *Pennsylvanian* 3 (1887–88): 209; Duncan E. Spaeth, "Psycho-Physical Lectures," *Pennsylvanian* 3 (1887–88): 239; clippings from the *Philadelphia Public Ledger*, Jan., Feb., and Mar. 1888, Cattell Papers.

[47] Charles P. B. Jeffreys, *Pennsylvanian* 3 (1887–88): 257, and *Pennsylvanian* 4 (1888–89): 9; Pepper, *Report of the Provost . . . 1889*, 16, 18, and also http://www.archives.upenn.edu/primdocs/upi/upi25_2/upi25_2_1887_1889.pdf.

[48] Pepper, *Report of the Provost . . . 1889*, 170; Frederick Fraley to Henry Phillips, Apr. 20, 1888, American Philosophical Society archives; James McKeen Cattell to William C. Cattell, Dec. 16, 1883, Elizabeth McKeen Cattell to James McKeen Cattell, May 11, 1886, June 18, 1888, and June 22, 1888, Cattell Papers; James McKeen Cattell, "The Psychological School," reprinted from the *Philadelphia Public Ledger* in the *Pennsylvanian* 5 (1889–90): 241; Samuel W. Fernberger, "The First Psychological Laboratory at the University of Pennsylvania," *Psychological Review* 25 (1928): 445.

eral new professors that the provost had just recruited and appointed. The two men never grew personally close. But the first month of 1889 was a special moment in the lives of both of them.

Experimental Achievement in the University's Laboratories

Through this period, Cattell began three scientific projects, focusing his attention successively on reaction times, on psychophysics, and on psychological testing. All three illustrated the impact of his scientific ideology and of the setting in which they began. The first extended Cattell's earlier research on reaction times to a study of the velocity of the nervous impulse in living human beings.[49] Working with Charles S. Dolley, professor of biology at the university—the two men experimented largely on each other—Cattell hypothesized that increasing the distance an impulse had to flow from the point of stimulation on an individual's body to his brain would increase his reaction time to the stimulus.[50] The experimenters thus varied the stimulus point along a subject's limb—for example, striking the big toe in one series of trials and the inside of the thigh in another—and measuring how these changes affected the reaction time. Their experiments used many kinds of stimuli—including electrical shocks, which blistered their subjects' skins—and sought consistent and precise quantitative results. Their work, however, remained inconclusive. For example, the impulses they studied apparently traveled faster in their subjects' legs than in their arms, and seemed twice as fast in Cattell's limbs as in Dolley's. They concluded that, though the speeds they measured fell "within the limits of those obtained by others, it does not seem likely that [a physiological trait like] the velocity of the nervous impulse . . . should differ so greatly in two observers."[51] From there, they argued that such variations in the reaction times they measured embodied "differences in cerebral processes" and thus further emphasized the importance of a differential psychology. Such a concern for the precise measurement of individual differences meshed well with Cattell's two other major projects at the university (see below), and he was

[49] James McKeen Cattell and Charles S. Dolley, "On Reaction-Times and the Velocity of the Nervous Impulse," *Memoirs of the National Academy of Sciences* 7 (1896): 393–415; first appearance (without figures and charts) in *Psychological Review* 1 (1894): 159–68; reprinted in Poffenberger, *James McKeen Cattell*, 1:265–301.

[50] James McKeen Cattell, ed., *American Men of Science*, 1st ed. (New York, 1906), 87.

[51] Cattell and Dolley, "On Reaction-Times and the Velocity of the Nervous Impulse," in Poffenberger, *James McKeen Cattell*, 1:284.

pleased when his work was later published. Those who nominated Cattell for National Academy membership in 1900 made sure to emphasize that "the scientific character of [this] paper could not be denied by the narrowest specialist."[52]

Cattell's second scientific project involved him and Fullerton—who by then held the title of Seybert Professor of Moral and Intellectual Philosophy—in a close collaboration that focused on experimental psychophysics. It led to a volume of the *Philosophical Series* of the *Publications of the University of Pennsylvania* entitled *On the Perception of Small Differences*.[53] Even today their research program remains closely identified with the university. It helped establish a scientific tradition that researchers at Pennsylvania long have followed, and psychophysicists still cite their long monograph over 120 years after its initial appearance.[54]

Despite Cattell's original title as "lecturer in psycho-physics" at the University of Pennsylvania—a title Pepper had selected—he had never before worked in experimental psychophysics. Earlier in the century, German physiologists had claimed that the magnitude of a felt sensation (as reported by an experimental subject) increased as the logarithm of the magnitude of the physical stimulus (as measured by an experimenter) causing it, expressing their conclusions in a mathematical formula known as Weber's law. Despite the precision of psychophysics' meticulous laboratory procedures, many psychologists avoided the field. Many reacted as did William James, who claimed that "the proper psychological outcome [of psychophysics] is just nothing." Specifically, James and others raised what came to be known as the "quantity objection." They argued that felt sensation quite simply could not be quantified, though many expressed their concerns more metaphorically. James wrote that "our feeling of pink is surely not a portion of our feeling of scarlet; nor does the light of an electric arc seem to contain that of a tallow candle in itself." Similarly, German psychologist Oswald Külpe argued that "this sensation of 'gray' is not two or three of that other sensation of 'gray,'" and through his reading in psychology, Fullerton came to accept the quantity objec-

[52] Sokal, "William James and the National Academy of Sciences," 32.

[53] George S. Fullerton and James McKeen Cattell, *On the Perception of Small Differences: With Special Reference to the Extent, Force, and Time of Movement*, Publications of the University of Pennsylvania, Philosophical Series, no. 2 (Philadelphia, 1892); reprinted in Poffenberger, *James McKeen Cattell*, 1:142–251.

[54] For example, see Lazar Stankov, Gerry Pallier, Vanessa Danthiir, et al., "Perceptual Underconfidence: A Conceptual Illusion?" *European Journal of Psychological Assessment* 28 (2012): 190–200.

tion.[55] During the late 1880s, he talked at length with Cattell about their joint psychological interests in a way that helped shape their experimental work years that followed.

Cattell readily accepted the quantity objection. Psychophysics assumed that an observer could accurately report, through careful introspection, when one sensation duplicated, or bore some other precise relation to, another. Cattell, however, never could introspect in Leipzig, and he doubted that anyone could observe his own mind that accurately. The experimenters' final report stressed that they "c[ould] not estimate such quantitative differences in sensation in a satisfactory manner." Like James before them, they generalized their conclusions metaphorically: "Most men will think that a just king is happier than a tyrant, but few will agree with Plato in considering him 729 times as happy."[56]

Both men still believed they could adapt psychophysical methods to study other important psychological phenomena, and they focused on the accuracy with which subjects made observations. As they distrusted methods that relied on familiar experiences or well-known stimuli, they studied what then was called the "muscular sense." They had their subjects swing their arms horizontally through a given distance, or with a given force, or at a given speed; as they noted, "common observation does not tell us what nervous or muscular mechanism is involved in movement, nor what sensory apparatus is used in its perception."[57] Rather than claiming to measure the magnitude of any sensation, they argued that their experiments measured their observers' "errors of observation" in using their "muscular sense" to try to replicate swings of previously set distances or forces or speeds. Their experiments recorded a total of 24,760 observations by ten different subjects; Fullerton, for example, swung his arm 4,400 times, through varying distances, with varying forces, and at varying speeds. Their final report exhibited the quantitative nature of Cattell's scientific ideology, and they claimed to have found a substitute for Weber's law, arguing that "the error of observation tends to increase as the square root of the magnitude" of the stimulus under observation.[58]

[55] William James, *Principles of Psychology*, 2 vols. (New York, 1890), 1:534, 546; Oswald Külpe, *Outlines of Psychology: Based Upon the Results of Experimental Observation*, trans. Edward B. Titchener (New York, 1895), 45.

[56] Fullerton and Cattell, "On the Perception of Small Differences," in Poffenberger, *James McKeen Cattell*, 1:152.

[57] Ibid., 1:152, 156–57.

[58] Ibid., 1:181–84, 245–46.

In some ways, Cattell and Fullerton did much to keep interest in psychophysics alive (especially at the University of Pennsylvania) through at least the first half of the twentieth century. Even today, psychophysicists look to them as important predecessors, and they still cite what they call the "Cattell formula" as one of several expressions of possible mathematical relations between a stimulus and a sensation.[59] In doing so, they ignore the objection from which Cattell and Fullerton started. But a late twentieth-century analysis of the field reports that psychophysicists ignore all expressions of this concern.[60]

Despite the success of these studies, Cattell's reputation in the history of psychology rests largely upon his work as a psychological tester, and—though he carried out most of this work in the 1890s, after he had left the University of Pennsylvania—he began to plan his tests and their execution as his third major scientific project in Philadelphia.[61] To be sure, all admit the failure of his testing program, since the results of none of his tests correlated well with the results of any other and none of his measurements correlated with any other measure of any of his subjects' traits: course grades, physical characteristics, health, and even class attendance. Nonetheless, modern psychologists often cite Cattell's work as an early example of what some call psychology's most lasting contribution to twenty-first-century American culture and look to him as a prophet of a utilitarian psychology.[62] However, such claims ignore that the goals and procedures of most current psychological tests do not have their roots in the techniques Cattell used or in his goals for his testing program. These

[59] See Joy P. Guilford, *Psychometric Methods*, 1st ed. (New York, 1936), 64–66, 201, 206; 2nd ed. (New York, 1954), 97–98, 145. See also Edwin G. Boring, "The Stimulus-Error," *American Journal of Psychology* 32 (1921): 449–71.

[60] Gail A. Hornstein, "Quantifying Psychological Phenomena: Debates, Dilemmas, and Implications," in *The Rise of Experimentation in American Psychology*, ed. Jill G. Morawski (New Haven, 1988), 1–34. An anonymous reviewer reports that modern "psychophysicists often ignore the quantity objection because they believe S. S. Stevens answered it in the 1940s (other disagree but . . . [*sic*])." The referred-to article is most likely Stevens, "On the Theory of Scales of Measurement," *Science*, n.s., 103 (1946): 677–80.

[61] Michael M. Sokal, "James McKeen Cattell and the Failure of Anthropometric Mental Testing, 1890–1901," in *The Problematic Science: Psychology in Nineteenth-Century Thought*, ed. William R. Woodward and Mitchell G. Ash (New York, 1982), 322–45; Sokal, "James McKeen Cattell and Mental Anthropometry: Nineteenth-Century Science and Reform and the Origins of Psychological Testing," in *Psychological Testing and American Society, 1890–1930*, ed. Michael M. Sokal (New Brunswick, NJ, 1987), 21–45.

[62] The most complete and insightful history of psychological testing yet written is John Carson, *The Measure of Merit: Talents, Intelligence, and Inequality in the French and American Republics, 1750–1940* (Princeton, NJ, 2007). See also Raymond E. Fancher, *The Intelligence Men: Makers of the IQ Controversy* (New York, 1985).

are best understood by reference to the setting in which Cattell first began developing his tests—the University of Pennsylvania—and to another Philadelphia researcher, the eminent neurologist S. Weir Mitchell.

In England, Galton had led Cattell to an interest in individual psychological differences, but this interest remained vague until he came to Philadelphia. There he apparently talked often with Mitchell and began considering how he might apply his science, as his Baconian views demanded, in a way that would be useful in a neurological practice. By 1889, he explicitly envisioned using his reaction-time procedures as "tests [that] may be of use in diagnosis" and announced his plans to study "the alteration in the time of physiological processes in diseases of the nervous system." These statements—made to a reporter of the university's student newspaper—represent Cattell's first mention of the use of his techniques as tests and make clear that he saw them as procedures designed to help physicians serve individual patients.[63]

Soon afterward, Cattell began to plan to use a full range of laboratory procedures to test for "loss of sensation, power, and intelligence." In briefly describing a projected series of ten such tests, he went even further. With Galton's anthropometric laboratory in mind, Cattell hoped that he could test hundreds of individuals and that "the same tests will be made elsewhere, so that the results of a large number of observations may be compared and combined."[64] Cattell's interest in testing thus derived from both the continuing influence of his scientific ideology—with its emphasis on utility and, especially, the collection of large amounts of precise quantitative data—and the personal influence of Francis Galton and S. Weir Mitchell. Unfortunately, however, his hopes to work with Mitchell in Philadelphia never bore fruit. Nevertheless, Cattell's testing program set the stage for the more practically focused and successful clinical psychology—based largely on tests that identified what we in the early twenty-first century call learning disabilities and sensory deficits—that his student Lightner Witmer later developed at the university.[65]

[63] Cornelis Mellyn, "Curious Experiments: Studying the Mysteries of Mind and Nerve Force," *Philadelphia Public Ledger*, Nov. 28, 1889, stray clipping, Cattell Papers; James McKeen Cattell, "Psychology at the University of Pennsylvania," *American Journal of Psychology* 3 (1890): 281–83.

[64] James McKeen Cattell, "Mental Tests and Measurements," *Mind* 15 (1890): 373–81; reprinted in Poffenberger, *James McKeen Cattell*, 1:132–41.

[65] Paul McReynolds, *Lightner Witmer: His Life and Times* (Washington, DC, 1997).

Cattell and the University of Pennsylvania circa 1890 and Afterward

By 1891, Cattell could be proud of all he had accomplished in Philadelphia. Even earlier, in 1890, a survey entitled "Psychology in American Colleges and Universities" reviewed teaching and research programs at eleven institutions—including, for example, William James's at Harvard—and made clear that the University of Pennsylvania was not unique in transforming its activity in philosophy by expanding its offerings and research support into the new psychology. Within this general trend, careful readers of this survey, and especially of Cattell's report on his activities, could readily conclude that the University of Pennsylvania ranked among the two or three best known and most active programs in the country.[66] Cattell had also profited greatly from his work with (or at least the influence of) three important Philadelphia researchers: biologist Dolley, philosopher Fullerton, and neurologist Mitchell. More personally, he felt quite content in Philadelphia. His parents, with whom he remained as close as ever, had settled in the city, and he saw them regularly. He and his wife, however, had long believed that "life in a city is neither physically, mentally nor morally healthy," especially for children, and they built a house in Mount Nebo, a small town about sixty-five miles west of the city in Lancaster County. But the long commute never shook his ties with the university, and the birth of their first child in February 1890—named Eleth, a contraction of his mother's name Elizabeth—reinforced his familial closeness and thus his ties to Philadelphia.[67]

On the other hand, Cattell's salary apparently never rose above the $1,000 that Pepper had promised Cattell's father, and he began to feel limited in Philadelphia. He had grown up in an upper-middle-class home and had gotten used to its attendant comforts, and he and his wife (in part due to Galton's influence) planned a large family. The younger Cattells looked to his parents to pay the servants their household required. Cattell often stressed his "cordial relations" with his University of Pennsylvania colleagues, including Pepper, and he regularly hoped for a salary increase. But he and Pepper were never especially close, and the hoped-for raise never came—perhaps in part due to the university's limited financial resources,

[66] "Psychology in American Colleges and Universities," *American Journal of Psychology* 3 (1890): 275–86.

[67] James McKeen Cattell to "Mama and Papa," Jan. 8, 1885, Sept. 20, 1886, Apr. 30, 1887, Dec. 6, 1888, Cattell Papers; Elizabeth McKeen Cattell to "Jim and Jo," June 9, 1889, June 20, 1889, Sept. 8, 1890, Sept. 15, 1890, Cattell Papers.

at least when compared to those of other "modern" universities—and Cattell soon began to seek other sources of income.[68] The special moment of January 1889 in his and Pepper's lives had passed.

Others—notably the scientifically trained and well-respected journalist Edwin E. Slosson, an especially astute and almost contemporaneous observer—later suggested that the analogous special moment in the university's own development passed soon afterward. Indeed, Slosson argued in 1910 that by the end of the 1890s, and perhaps earlier, the University of Pennsylvania had begun to slight (or even abandon) Pepper's vision of what a modern university should be.[69] Slosson was best known as the literary editor of the *Independent*, a leading cultural journal, and he drew on his University of Chicago PhD and journalistic experience to investigate American intellectual trends in the early twentieth century.[70] One study led to a series of articles and an impactful book, *Great American Universities*, which profiled the histories and current conditions of fourteen major institutions that claimed to be among the country's most important, including the University of Pennsylvania. His report derived much of its authority from its comparative perspective and its concern for each institution's recent past. Slosson never claimed it was a definitive study, but it provides many interesting insights.

For example, despite the continued distinguished work in Philadelphia of Semiticist Morris Jastrow Jr. and chemist Edgar Fahs Smith (cited earlier), Slosson reported that, at the University of Pennsylvania, not all professors shared Pepper's desire to promote research. Pepper had retired in 1895—he lived another three years—and Slosson concluded that "many of the professors taught [simply] for the fun of the thing."[71] More seriously, he noted the long-standing "strong . . . centrifugal forces" at the university that for years fostered the growth of specialized schools, such as those of dentistry (founded in 1878, not by the university itself but by the medical school) and veterinary medicine (founded 1884). Once founded, Slosson wrote, each of these schools then tended to act "like a Balkan province"

[68] James McKeen Cattell to Seth Low, Sept. 20, 1890, James McKeen Cattell Papers, Rare Book and Manuscript Library, Columbia University Library; Slosson, "University of Pennsylvania," in *Great American Universities*, 344–72.

[69] A late twentieth-century history of the university by one of its former presidents disputes this view. See Meyerson and Winegrad, *Gladly Learn and Gladly Teach*. But see also Geiger, *History of American Higher Education*, 350–54.

[70] David J. Rhees, "Edwin E. Slosson," in Garraty and Carnes, *American National Biography*, 20:108–9.

[71] Slosson, "University of Pennsylvania," 371.

and "agitate[d] for autonomy," such as that long enjoyed by the medical school. Slosson feared that as this trend continued, "There will be left only a flock of studies which nobody has any particular use for." To be sure, he noted that other "modern" universities faced similar problems and that their administrations and faculties were "worrying about this a good deal." Damningly, however, he concluded that "nobody seems to worry in the University of Pennsylvania about anything."[72]

As Slosson noted, the prime beneficiaries of these "centrifugal forces" were those areas that promised immediate and obvious practicability. For example, Pennsylvania's Wharton School of Finance and Commerce (founded in 1881) flourished. An early Wharton dean—Edward James, with a PhD from University of Halle—did try to create within the school an academically oriented School of Political and Social Sciences. But Pepper's successor, Charles C. Harrison, demanded James's resignation during his first day as provost. No wonder, then, that a later observer equated Wharton's role at the University of Pennsylvania with that of agricultural schools at state universities.[73]

The university's academic aspirations faced other problems. For example, many Philadelphians also supported construction before scholarship, and though some professors at other institutions envied the university's splendid buildings, others retorted that "they need men more than marble down in Philadelphia."[74] These attitudes suggested to Slosson that the "flock of studies which nobody has any particular use for"—including even programs such as Cattell's, with its potential applicability—faced real difficulties at the university. Cattell's stagnant salary reinforces this conclusion.

That said, Lightner Witmer's psychological clinic continued to thrive in this setting, apparently because it offered immediately practical diagnostic services to Philadelphia schoolchildren. Even the university's critics praised its testing and remedial programs that identified and ameliorated specific problems and that, with "some hygiene, and a great deal of patience," transformed "open-mouthed, dull-eyed, and logy children" into engaged students "doing sums on the blackboard and cutting up between times."[75]

[72] Ibid., 356.

[73] Geiger, *History of American Higher Education*, 353–54; Veysey, *Emergence of the American University*, 112.

[74] Baltzell, *Puritan Boston and Quaker Philadelphia*, 260–62; Slosson, "University of Pennsylvania," 358–60.

[75] Slosson, "University of Pennsylvania," 370–71; Robert I. Watson, "Lightner Witmer: 1867–1956," *American Journal of Psychology* 69 (1956): 680–82; John M. O'Donnell, "The Clinical Psychology

Columbia University and Cattell

Meanwhile, even as Pepper's vision blossomed and then faded at the University of Pennsylvania, another American college began to wake from its doldrums and transform itself. In 1878, Henry Adams had the New Yorker protagonist of his novel *Democracy* ridicule Columbia College of her home city. As she told a friend, "Do you know . . . that we have in New York already the richest university in America, and that its only trouble has always been that it can get no scholars even by paying for them?" But the 1890 appointment as its president of Seth Low, a former mayor of the then-independent city of Brooklyn and a well-respected public citizen and reformer, soon changed things.

With Low as president, the college set out to alter its situation. Early in 1890, faculty leader Nicholas Murray Butler announced "hopes to secure within a few months not only a specialist in Experimental Psychology, but also a well-arranged laboratory and a fair stock of apparatus."[76] By that spring, he and Low had arranged for Cattell to lecture one day a week at Columbia, paying him $1,000 for this service, the equivalent of his entire University of Pennsylvania salary. After a year's commuting, he moved to New York as Columbia's professor of experimental psychology, with a salary of $2,500.[77] In 1902, when Low was elected mayor of the now-unified city of New York, Butler became Columbia's president, and one later observer claimed that his and his administration's activity levels made those of Pepper and his contemporaries seem old-fashioned. Indeed, a just-published early twenty-first-century analysis of the two historically and geographically similar institutions concluded that "Columbia emerged a stronger university, benefitting from more effective leadership, greater wealth, support from local elites, and a stronger commitment to academic excellence."[78]

Columbia flourished through the 1890s and long afterward—in 1896 it officially took the name Columbia University in the City of New York—as

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of Lightner Witmer: A Case Study of Institutional Innovation and Intellectual Change," *Journal of the History of the Behavioral Sciences* 15 (1979): 3–17.

[76] Nicholas Murray Butler, "Psychology at Columbia College," *American Journal of Psychology* 3 (1890): 277–78.

[77] Seth Low to Nicholas Murray Butler, Dec. 17, 1890, Butler to Low, Dec. 17, 1890, Low to James McKeen Cattell, Dec. 18, 1890, Cattell to Low, Dec. 20, 1890, James McKeen Cattell Papers, Rare Book and Manuscript Library, Columbia University Library.

[78] Veysey, *Emergence of the American University*, 305–6; Geiger, "Columbia College and the University of Pennsylvania," in *History of American Higher Education*, 350–54.

did Cattell for many years. At Columbia he completed all three projects he had originated in Philadelphia. Most notably, through the 1890s, he implemented the testing program he had sketched in Philadelphia. This effort brought him attention, both from his fellow psychologists and from the public at large.[79] He remained at Columbia until 1917, when he was dismissed from his professorship, largely due to an antagonistic relationships with Butler and his faculty colleagues, but ostensibly (as many still believe) because of his opposition to US Army conscription policies during World War I.[80]

In the meantime, Cattell had established a journalistic empire, as he owned and edited some of America's most important scientific periodicals, most significantly the weekly journal *Science*, which he took control of in 1895.[81] He was also a longtime leader of the American Association for the Advancement of Science—from 1920, he chaired its executive committee for over twenty years—and other American scientific organizations.[82] He died in 1944, and the positive editorial commentary that his lifetime achievement then attracted—in the scientific and even the popular press—suggests that many recognized his major significance for twentieth-century American science, and for American culture in general.[83] None of this commentary, however, noted the role played by William Pepper of the University of Pennsylvania in providing the initial spark for Cattell's professional career in America.

Psychology at the University of Pennsylvania after Cattell

Psychology at the University of Pennsylvania did not disappear with Cattell's 1891 departure.[84] The university's psychological clinic contin-

[79] James McKeen Cattell and Livingston Farrand, "Physical and Mental Measurements of the Student of Columbia University," *Psychological Review* 3 (1896): 618–48; reprinted in Poffenberger, *James McKeen Cattell*, 1:305–30; Sokal, "James McKeen Cattell and the Failure of Anthropometric Mental Testing."

[80] Michael M. Sokal, "James McKeen Cattell, Columbia University, and Academic Freedom at Columbia University, 1902–1923," *History of Psychology* 12 (2009): 87–122.

[81] For example, see Michael M. Sokal, "*Science* and James McKeen Cattell," *Science*, n.s., 209 (1980): 43–52; Sokal, "Baldwin, Cattell, and the *Psychological Review*: A Collaboration and Its Discontents," *History of the Human Sciences* 10 (1997): 57–89; and Sokal, "Star-Gazing: James McKeen Cattell, *American Men of Science*, and the Reward Structure of the American Scientific Community, 1906–44," in *Psychology, Science, and Human Affairs: Essays in Honor of William Bevan*, ed. Frank Kessel (Boulder, CO, 1995), 64–86.

[82] Sally Gregory Kohlstedt, Michael M. Sokal, and Bruce V. Lewenstein, *The Establishment of Science in America: 150 Years of the American Association for the Advancement of Science* (New Brunswick, NJ, 1999).

[83] "Dr. Cattell Dead: Scientist, Editor," *New York Times*, Jan. 21, 1944, 17; "Death of an Editor," *Time*, Jan. 31, 1944, 61.

[84] See Jonathan Baron, "History of Psychology at Penn," last modified Mar. 7, 2008, accessed Feb. 3, 2015, http://www.psych.upenn.edu/history/history.htm.

ued under Lightner Witmer's direction until he retired in 1937, and for years he continued to emphasize "Practical Work in Psychology."[85] In the 1920s one member of his staff, Morris Viteles, even extended such "practical work" into vocational guidance, which soon became a major focus for the clinic.[86] Meanwhile, at least into the 1940s, the university's psychological laboratory emphasized research in psychophysics and remained a leader in this experimental field. In this way, such eminent Pennsylvania psychophysicists as Friedrich Maria Urban, Samuel W. Fernberger, and Francis W. Irwin successively continued for many years the tradition initiated by Cattell and Fullerton in the early 1890s, even as other university departments devoted less and less attention to this area.[87] According to the current department's own historical sketch, however, psychology at the university did not really change until 1958, when mathematical psychologist Robert Bush became its chair, with "a mandate to re-build the department."[88] Through the 1960s and 1970s, the department gradually earned an international reputation for its members' development of what soon became known as cognitive science. In 1991 the Institute for Research in Cognitive Science emerged and, concurrently, faculty with other psychological interests established thriving teaching and research programs.

By the 1980s, few could doubt that the University of Pennsylvania was the site of cutting-edge research in psychological cognitive science. As this article demonstrates, however, the path it took to achieve this status proved to be anything but smooth, even as Pepper's and Cattell's professional goals resonated with each other. As noted, the two men differed significantly—in age, if nothing else—and since (as noted) Cattell was only one of the provost's new faculty appointments, they never shared an intense personal relationship. More generally, as Slosson's 1910 observations suggest, for many years the powers-that-were at the university seem to

[85] Lightner Witmer, "The Organization of Practical Work in Psychology," *Psychological Review* 4 (1897): 116–17; Lightner Witmer, "Practical Work in Psychology," *Pediatrics* 2 (1896): 462–71.

[86] Morris S. Viteles, in *A History of Psychology in Autobiography*, vol. 5, ed. Edwin G. Boring and Gardner Lindzey (New York, 1967), 417–500. See also Michael M. Sokal, "James McKeen Cattell and American Psychology in the 1920s," in *Explorations in the History of Psychology in the United States*, ed. Josef Brozek (Lewisburg, PA, 1984), 273–323.

[87] Jutta E. Ertle, Roger C. Bushong, and William A. Hillix, "The Real F. M. Urban," *Journal of the History of the Behavioral Sciences* 13 (1977): 379–83; Michael M. Sokal, "F. M. Urban and the Value of Archival Material," *Journal of the History of the Behavioral Sciences* 14 (1978): 170–72; Francis W. Irwin, "Samuel Weiller Fernberger: 1887–1956," *American Journal of Psychology* 69 (1956): 676–80; Julius Wishner and Richard L. Solomon, "Francis W. Irwin (1905–1985)," *American Psychologist* 42 (1987): 400–401.

[88] See Jonathan Baron, "History of Psychology at Penn."

have slighted Pepper's broader goal of establishing a "modern university" in the city, and by 1891 Cattell's personal situation left him no real choice but to accept Columbia's offer.

Meanwhile, in addressing the late nineteenth-century revolution in American higher education, historians seem too often to have focused on what some see as the unqualified success of the creations of Johns Hopkins (under its founding president Gilman) and the University of Chicago (Harper) and the positive transformations of Harvard (Eliot) and Columbia (Low and Butler). To be sure, all recognize that not all the presidents of these new or reformed universities provided the same unmixed positive leadership. Perhaps most notably, all recognize the damage that Butler's dictatorial policies and practices caused at Columbia, and all admit that G. Stanley Hall's continued mendacious despotism did almost irreparable harm to Clark.[89] But with the exception of a just-published book, *The History of American Higher Education: Learning and Culture from the Founding to World War II*, few seem fully aware of William Pepper's contemporaneous efforts and his partially realized vision for the University of Pennsylvania. This article, then, helps illuminate another side of this revolution.

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[89] William A. Koelsch, *Clark University, 1887-1987: A Narrative History* (Worcester, MA: 1987).