
A Convenient Model for the Evolution of Early Psychology as a Scientific Discipline

Robert Epstein
Harvard University

Scientific and technological advances by the 1850s serve as a backdrop for an appreciation of early psychology.

With the recent resurgence in interest in the history of psychology, there has come an increasing demand for better materials for teaching historical topics. Particularly lacking are aids for those instructors who don't wish to become historians or to devote large portions of a course to history, but merely to supplement a course with historical readings. Below is a convenient historical model, used in a course I teach called "Contemporary Psychology in a Historical Framework," that should be useful for this purpose. It takes advantage of a number of historical coincidences to give a coherent, easily remembered account of some of the major steps by which modern scientific psychology evolved in the last century.

The model could be used as part of a quick historical introduction to the field or perhaps for that inevitable lecture on "Is Psychology a Science?" I have used it as a starting point for examining the great leaps psychology has had to make to reach its modern form and supplemented it with historical readings that make the point. I especially recommend Herbart's "Possibility and Necessity of Applying Mathematics in Psychology" (1877). Students enjoy its polemical tone and get a good sense of the novelty of his views early in the last century. The various introductory materials and first few chapters of the Adler translation of the first part of Fechner's *Elemente der Psychophysik* (1966) (originally 1860) are also interesting and manageable readings, as are the first few chapters of the English version of Ebbinghaus' *Ueber das Gedächtnis* (1913) (originally 1885). In each case students make contact with major breakthroughs in the evolution of psychology as science. The simplicity of the model lends itself to expansion in a number of ways; one should choose readings according to one's course plan and point of view.¹

In looking at the relationship between science and early psychology, we might list events in the natural sciences that affected the field. This is the usual approach. In biology, evolutionary theory helped stimulate animal and comparative psychologies, as well as behaviorism. In physics, conservation theories of energy strengthened various positions on the mind-body dilemma and affected the evolution of psychopathology. In astronomy, Bessel's discovery of the personal equation contributed to the development of mental chronometry. And in physiology, developments in the investigation of the senses as well as of brain and nerve function provided subject matter, methodology, and training for most

early psychologists. Technical advances, such as the invention of the compound microscope in the 1830's or the chronoscope around 1850, were crucial, just as they are today.

The Decade of the Fifties. We might also develop a chronology. For the sake of brevity, I should like to point out the importance of a single decade—the 1850s. The groundwork for a scientific psychology had been laid before this time, and by the 1860s a structure rested tenuously on it. The *Institute* had not yet opened its doors, but James recognized the field as a science, and Wundt's *Vorlesungen* and *Beiträge* were in print. It was in the 1850s that technical advances, philosophy, and the natural sciences converged to make psychology a science as its later practitioners would define it. Fechner's work was underway following his vision of 1850. Wundt conducted his first psychological experiments and published the first part of his *Beiträge* in 1858, also the year he was reportedly concerned with Herbart's *Psychologie als Wissenschaft*. Lotze's *Medizinische Psychologie* was published in 1852. Bain and Spencer, each drawing heavily on data from the natural sciences, published major works in 1855. The chronoscope was developed and improved, the absolute personal equation devised, and Helmholtz's landmark works on nerve function and vision published. And *The Origin of Species* appeared in 1859. The 1850's can be justly described as the crossroads between the old and the new psychologies.

Out of this chaos of events, the succession of views of three men can be taken as a useful model of the evolution of psychology as a science in the 19th century. I am speaking of three important figures who succeeded each other in the same chair at the University of Göttingen—Johann Friedrich Herbart, Hermann Lotze, and Georg Elias Müller. Herbart was a professor at Göttingen for the last eight years of his life, from 1833 to 1841. (He also earned his Ph.D. and was a Dozent there early in his career.) Lotze was there for 37 years, from 1844 until shortly before his death in 1881, and Müller, for 40 years, from 1881 to 1921. The three men conveniently span the century.²

Johann Friedrich Herbart. Herbart was born in the year of Hume's death and was Kant's successor at Königsberg. Appropriately, he was to take the first major step in weaning psychology away from philosophy. He was probably Ger-

many's foremost philosopher in his day and profoundly influenced both Wundt and Freud. His concepts of the limen and apperceptive mass are part of the fabric of modern psychology. We remember him primarily as "the father of scientific pedagogy," but his psychological mechanics was his crucial contribution to psychology.

In his *Lehrbuch zur Psychologie*, first published in 1816, Herbart radically departed from philosophical tradition by proposing that the metaphysical study of psychology be supplemented by two of the methods of the natural sciences—observation and mathematics.³ Mental states consist of ideas, he said, and the nature of their interaction is discernible through observation. The interaction can then be represented algebraically, facilitating prediction and further elaboration. Solutions to the problems of psychology, wrote Herbart, demand, besides metaphysics, "higher mathematics, inasmuch as the ideas must be regarded as forces whose effectiveness depends upon their strength, their opposition, and their combination, all of which are different in degree" (Herbart, 1816, p. 7; 1891, p. 6).⁴ Herbart's *Vorstellungen* were fully specified in the first *Lehrbuch* and later elaborated in the influential *Psychologie als Wissenschaft* (1824-5).⁵

The second edition of the *Lehrbuch* (originally 1834, republished in 1850) was virtually identical to the first, except in one major respect. The mathematical section delineating the mental mechanics was moved from the middle of the book to its very beginning, reflecting the growing status this position had taken in 18 years. Also in this edition, Herbart's view of psychology's place with respect to the natural sciences was more clearly stated. The "three principal branches" of the *Naturwissenschaften* of his day, he said, were natural history, physics, and physiology, distinctive as follows: Natural history "may first present individual examples of the objects which it afterwards classifies" (Herbart, 1850, p. 7; 1891, p. 2). Psychology, however, doesn't fit this model. "On the contrary, no material of facts lies at the foundation of psychology, spread out before the eyes so that it can be definitely shown and classified into subordinate and higher classes without any gaps in the series. Self-consciousness mutilates the facts of consciousness even in the act of seizing them . . ." (1850, p. 8; 1891, p. 3). Empirical physics has used experimentation and mathematics to discover "laws according to which phenomena take place." We cannot adopt this model intact, however, since "Psychology cannot experiment with men, and there is no apparatus for this purpose" (Weber's *de Tactu*, an important prelude to Fechner's work, was published the year Herbart made this pronouncement). "So much the more carefully," wrote Herbart, "must we make use of mathematics" (1850, p. 9; 1891, p. 4). The model of physiology is rejected because its subject matter corresponds so poorly to psychology's triumvirate: thinking, feeling, and willing. "And, besides this, the whole mental existence of man is immeasurably more changeable than any object of physiology whatsoever" (1850, p. 10; 1891, p. 5).

Herbart was well aware of the uniqueness of his position and was not above exhortatory and polemical defense. In a lecture he noted the "amazement" of some of his contemporaries that he had introduced mathematics to psychology (Herbart, 1877).⁶ Counterarguments he dismissed

as "palpably untrue," due to "the fetters of habits," "prejudices," "confusion and error," and "strange notions." Mathematical certainty, he argued, is the only alternative to "an indefinite talk, interpreted differently by each individual and which only multiplies the disputes" (p. 262). "Mathematics is the ruling science of our time . . . He who does not befriend it, will have it his enemy in the future" (p. 262).

Hermann Lotze. Lotze, Herbart's successor, was educated in the 1830's at Leipzig, where he studied with great success in both the faculties of medicine and philosophy. Only five years after he began his studies he was appointed *Dozent* in both faculties. After publishing two philosophical works and one medical work in just three years, he received a professorship in philosophy at Göttingen. There he published works on aesthetics and physiology, and finally, in 1852, a landmark work for psychology—*Medicinische Psychologie oder Physiologie der Seele*. It contained the first statement of the local sign theory of space perception and more important for our purposes, physiological and medical data applied to psychological problems.

Lotze's eclecticism was revered. He lectured on logic, metaphysics, ethics, psychology, aesthetics, and religion, analyzed clothing and art, and even published a long book of poetry. His goal was to reconcile science, "with its severe logic of causation and mechanism," with the human heart, to bring out the preestablished harmony between them (Hall, 1912). G. Stanley Hall (1912, p. 93) elegantly described Lotze's contribution to the evolution of psychology thus:

Lotze, perhaps better than any other, marks the transition from a metaphysical psychology to one based on induction from physical and bodily states. His "Medical Psychology" (1852) best marks this passage from the old to the new. He sought to give both their due, to make peace between them, and to be at once a physiologist and a metaphysician of the soul. In Psychology, as in every other philosophic discipline he touched, he strove to be a reconciliator, with the result that his system has taken its place as representing a period of transition of the greatest importance in its time . . . When others sought to differentiate, he sought to integrate, so that, if his bridges were faultily built or insecurely buttressed, and if some are falling superseded, still they made possible a great and profitable traffic and greatly helped on evolution without revolution in their day. Thus, historically, modern scientific psychology owes him a great debt, for he not only mitigated the prejudices of the old philosophic camp but mobilized it for further advance. If we would now evict some of his metaphysics from our laboratories and clinics, let us not forget that he made the traditions of the old speculative systems and even of religion friendly and even gift-bearing to our science when it was helpless and in its swaddling clothes.

Eclectic though he was, Lotze was not a scientist, but through both his writings and teachings, inspired others to enter the laboratory. Both Stumpf and G. E. Müller were his students, and each became experimentalists. His work, wrote Müller, "aroused in me the conviction that a thorough grounding in the natural sciences is requisite for a fruitful pursuit of philosophy . . . He is the one . . . who kept me in a scientific career and helped my progress. I can think of him only with the deepest gratitude" (quoted in Boring, 1935).

Georg Elias Müller. Müller succeeded Lotze in his position at Göttingen after Lotze was persuaded to go to Berlin in 1881

(Lotze died a few months later). He had received his Ph.D. under Lotze in 1873 and had been influenced by the writings of both Herbart and Lotze long before he came to study at Göttingen. Under Lotze he conducted the first empirical study of attention and soon distinguished himself in psychophysics and eventually in extensive laboratory work in memory and vision. By the 1870's, psychological experimentation had already long been a reality. According to Müller, for a career in psychology at that time, one had to know not only Herbart and Lotze, but Fechner, Helmholtz on acoustics and optics, and Wundt's *Vorlesungen* (as well as Bain and other work). Herbart and Lotze, through their acceptance of the natural sciences, had inadvertently helped legitimize experimentation in the field.

By the beginning of this century Kant's doctrine had given way to dozens of psychological laboratories and in the case of Müller, to the pathological researcher. David Katz, Müller's official assistant for twelve years (from 1907 to 1918), described his "ideal of strict accuracy" and "passion for methodology." In his meticulousness, he served as a subject in "every single investigation" conducted in his laboratory and was so devoted to his scientific work that "for years and years his body was almost exhausted through insomnia" (Katz, 1935).

Summary. The succession from Herbart to Lotze to Müller characterizes the move to a scientific psychology. Herbart rejected the claim that mind was not amenable to measurement and raised psychology to the level of the natural sciences by injecting mathematics and observation into psychological study. Lotze made science more acceptable in attempting to reconcile it with philosophical tradition and by incorporating physiological data into psychological works. By Müller's day, experimentation, sanctioned by neither Herbart nor Lotze, had intruded itself into the model, and philosophical concerns were taking second place to the laboratory.

Herbart (1850, p. 14; 1891, p. 8) appended the following statement to the second edition of the *Lehrbuch*, an extraordinary statement in his day, but thematic of the field that was to follow:

[Psychology's] work is . . . to explain; not to exhibit curiosities, but to make man as he is generally comprehensible; neither to raise him to heaven, nor to fix him immovably in the dust; not to close the lines of investigation, but to open them.

In spite of persistent epistemological difficulties, that surely is the spirit that moves psychology.

References

- Boring, E. G. Georg Elias Müller: 1850-1934. *American Journal of Psychology*, 1935, 47, 344-348.
- Diamond, S. (Ed.). *The roots of psychology: A sourcebook in the history of ideas*. New York: Basic Books, 1974.
- Ebbinghaus, H. *Memory: A contribution to experimental psychology*. New York: Teachers College, Columbia University, 1913.
- Fechner, G. *Elements of psychophysics* (Vol. I). New York: Holt, Rinehart, and Winston, 1966.
- Hall, G. S. *Founders of modern psychology*. New York: Appleton, 1912.

- Herbart, J. F. *Lehrbuch zur Psychologie*. Königsberg: Unzer, 1816.
- Herbart, J. F. *Ueber die Möglichkeit und Nothwendigkeit Mathematik auf Psychologie anzuwenden*. Königsberg: Unzer, 1822.
- Herbart, J. F. *Psychologie als Wissenschaft, neu gegründet auf Erfahrung, Metaphysik und Mathematik*. Amsterdam: Bonset, 1968. (originally Königsberg: Unzer, 1824-1825)
- Herbart, J. F. *Lehrbuch zur Psychologie* (2nd ed.). Königsberg: Unzer, 1834.
- Herbart, J. F. *Lehrbuch zur Psychologie* (2nd ed.). In *Sämmtliche Werke*, Vol. 5. Leipzig: Verlag von Leopold Voss, 1850.
- Herbart, J. F. Possibility and necessity of applying mathematics in psychology. *Journal of Speculative Philosophy*, 1877, 11, 251-264.
- Herrnstein, R. J., & Boring, E. G. (Eds.). *A source book in the history of psychology*. Cambridge: Harvard, 1965.
- Katz, D. Georg Elias Müller. *Psychological Bulletin*, 1935, 32, 377-380.
- Leary, D. E. The philosophical development of the concept of psychology in Germany, 1780-1850. *Journal of the History of the Behavioral Sciences*, 1978, 14, 113-131.
- Lotze, H. *Medicinische Psychologie oder Physiologie der Seele*. Leipzig: Weidmann'sche Buchhandlung, 1852.
- Lotze, H. *Outlines of metaphysics*. Boston: Ginn, Heath, 1884.
- Lotze, H. *Outlines of practical philosophy*. Boston: Ginn, 1885.
- Lotze, H. *Outlines of psychology: Dictated portions of lectures by Hermann Lotze* (3rd ed.). Boston: Ginn, 1886a.
- Lotze, H. *Outlines of aesthetics*. Boston: Ginn, 1886b.
- Lotze, H. *Metaphysics, in three books: Ontology, cosmology, and psychology* (2nd ed.). Oxford: Clarendon Press, 1887.
- Lotze, H. *Lotze's system of philosophy. I. Logic. II. Metaphysics*. Oxford: Clarendon Press, 1887-1888.
- Lotze, H. *Logic, in three books: Of thought, of investigation, and of knowledge* (2nd ed.). Oxford: Clarendon Press, 1888.
- Lotze, H. *Microcosmos: An essay concerning man and his relations to the world* (4th ed.). Edinburgh: Clark, 1889.
- Mandler, J. M., & Mandler, G. (Eds.). *Thinking: From association to Gestalt*. New York: Wiley, 1964.
- Mueller, C. Some origins of psychology as science. *Annual Review of Psychology*, 1979, 30, 9-29.

Notes

1. The model takes advantage of links between Herbart, Lotze, and G. E. Müller. Though many of Lotze's works have been translated (e.g., Lotze, 1884, 1885, 1886a, 1886b, 1887, 1887-1888, 1888, 1889), the relevant ones have not (though slivers of his *Medicinische Psychologie* appear in Herrnstein and Boring [1965] and Diamond [1974]), and virtually none of G. E. Müller's works are available (though, again, there are slivers in Mandler and Mandler [1964] and Herrnstein and Boring [1965]). Current pieces, such as Mueller (1979), are useful for looking at the broader picture.
2. The transition from Kant to early scientific conceptions of psychology in Germany has been examined by Leary (1978).
3. There were precedents for this contribution. Christian Wolf, for example, claimed to be the first to present a mathematical view of mind in his *Psychologia Empirica* (Francofurti and Lipsiae, 1738).
4. I have cited two page numbers and references to indicate both German and English versions of the quotation. The English I give is either directly from or a slightly modified version of the 1891 translation of the second German edition (Herbart, 1834). I continue to cite both German and English sources below.
5. In his *Ueber die Möglichkeit und Nothwendigkeit Mathematik auf Psychologie anzuwenden* (1822) he claims that he proposed a mathematical psychology as early as 1806.
6. The original version is not identified, but the article is in fact a shortened version of *Mathematik auf Psychologie* (1822).
7. Based on a paper presented at the 87th meeting of the American Psychological Association, New York, NY, September, 1979.
8. Correspondence should be sent to the author at the Department of Psychology and Social Relations, Harvard University, Cambridge, MA 02138.