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GATES, Elmer, scientist, was born near Dayton**,** 0[hio]., 1858 [*correct date, 1859*], son of Jacob and Phoebe Gates. His father was a teacher and preacher by profession and his mother a daughter of J. Diederich, an architect. The family is of German extraction and the name was originally spelled Goetz.

Early in life Prof. Gates attained such remarkable maturity of mind that his original experiments and investigations contributed several valuable additions to current science. Having passed through the common and normal schools of his native state, he took short elective courses at several colleges, but was mostly taught by private tutors. He devoted particular attention to physics, chemistry, mathematics and biology, working over nearly every one of them in his private laboratory, and, having acquired facility in five languages, made himself familiar with most of the modern literature in each branch.

His labors to this point were conducted with a distinctly psychologic and philosophic aim—to identify and classify the several functions of mind in the acquisition, analysis and assimilation of knowledge—and in 1878 he announced the discovery of a new domain of experimental psychology, by the application of scientific experiment to introspection. By thoroughly investigating the mutual effects and interactions of the several mental functions—intellection, emotion, volition—as they are to be observed subjectively, he arrived at definite qualitative and quantitative results: by studying the subjective effect of each environment and bodily state, and the relations between the effects thus induced, and as modified by other similar effects, on the originative functions of mind, he formulated a definite working theory of the conditions essential to the augmentation of mental

capacity and the discovery of new ideas. Thus was discovered what he has termed the "art of mentation," the method of promoting the functional activities and productive power of mind, by so regulating the bodily and environing conditions and so controlling the intellective functionings as to conserve the organic energies and facilitate the genesis of new concepts, ideas and thoughts.

His thesis is that every conscious mental operation or experience creates in some part of the brain or nervous system new structural changes of cell and fibre, and that adequate and harmonious culture of the senses, and thence of each of the higher intellective, emotive and conative faculties, results in a process of brain building, which produces the ‘‘embodiment of more mind.’’

During 1878 he also extended his new method of research known as ‘‘auturgic psychology," which consists in causing some one function of the mind to act upon some other, and in observing introspectively the mutual effects of their interactions, by a comparison of the introspective records of different individuals, made by themselves—which he has called "comparative variational psychology," a study promising to eliminate the personal equation and the individual idiosyncrasy from introspection. Thus he has established two distinct methods of introspective psychological investigation: the auturgic and variational.

To suit the conclusions of his investigations, he originated a new classification of psychological science into six branches: three relating to the experimental variation of environment and organic structure as determining the effects on mentation; three relating to variations of mental activities to determining the effects on body and environment. To his collective methods of brain-building, and mind using, he has applied the name psychurgy, as indicating the augmentation and more efficient using of mental activities in discovery, learning and invention by the normal exercise of these functionings within their proper environment and under proper bodily conditions for the discovery of truth and its application to human affairs. This department he has also classified into six branches: intellect-building, emotion-building, volition-building; and cognitive-mentation, aesthetic-mentation and conative-mentation.

Prof. Gates enumerates nine orders of sensation— touch, pressure, warmth, cold, muscular feeling, smell, taste, sight, hearing; seven steps in intellection—sensation, perception imaging, conception, ideation, thinking of several successively higher degrees of generality and introspection; and three orders of reasoning—conceptual, ideative, and thinking. The emotions and volitions he has similarly classified.

His theory of education is an inductive appeal to each psychological function by presenting first-hand and successively sensations, percepts, images, concepts, ideas and thoughts—each as representing a synthesis or generalization on its predecessors—of any given science in order to its mastery by calling forth the corresponding functional activities in psychurgic sequence. The sciences are to be studied as psychologic subjects, because they are products of mentation and kinds of mental content and modes of mentation. The conclusion is, not only the pedagogical principle that the process of mastering a science should begin with the rudiments of sensation and proceed to higher grades of generalization as the mind-functions emerge to receive and appropriate them; but also that moral and physical functions may be so shaped, built up and directed by adequate appeals as to preclude such faults of character and such organic diseases as seem to be involved in structures congenitally faulty.

This latter principle, in the professor's own words, involves that: "If the cell is to be active in overcoming disease in its immediate vicinity or in itself, it must utilize its own energy in performing its functions. If it be imperfectly fed, it will not have this energy, this *vis medatrix naturae,* with which to cure the disease. The new line of research consists in having discovered that by a combination of brain-building and dirigation, and emotional regulation, with the selection of proper kinds of foods and chemical substances, the cells of a particular organ can be fed their specific nutriments," thus increasing its efficiency and enabling the warding-off of disease. In this method, he claims he has discovered the fundamental law of cure.

The task that Prof. Gates has proposed to himself, in order to perfect the practical bearings of his theory, involves no less an undertaking than "a systematic and accurate study of each of the sciences so as to collect, from the great literatures of the world, and from the objects and phenomena of the sciences all of the mentative data of each science." This done, and a corresponding laboratory equipment for each science once obtained, the method will be ready for application to classes and schools.

He has applied the principles of his psychurgic doctrine to the mastery of several sciences, and, in his own words, has also found his own mental efforts more than quadrupled in efficiency. As a friend of his remarked recently: "He does something original in some art or science nearly every day of his life." He has made hundreds of inventions and discoveries in the various arts and sciences; some of them of immense importance. In acoustics and music he has discovered that by varying the overtones in the notes of an instrument, it is possible to change the emotional quality or timbre of every note at will. He has also discovered that in

landscape painting the impression of distance is due to some other cause than perspective, and that there is a well-defined order in which colors become relatively invisible to the eye, some persisting to a greater distance than others.

Among his most notable inventions are the diamagnetic and magnetic separator, which takes all gold out of magnetic or ordinary sand; aseptic brewing and fermenting that obviates the presence of ptomaines in spiritous drinks; an electric loom, operating the shuttles without counter-shafting, belts, lay-motion, or picker sticks; an electro-static machine, working equally well in moist or dry weather, and numerous psychologic, scientific and educational contrivances. His recent discoveries in electric meteorology had the endorsement of Prof. Hazen, of the U. S. weather bureau. He also designed a machine which made 10,000,000 alloys, each differing by one ten-millionth part, in one hour; a result probably requiring, by the old methods, at least 1,000 years to be accomplished by one man.

With the proceeds of his inventions and the donations received from persons interested in his theories, be has been enabled to equip extensive laboratories for experimental research in several branches of science. In 1894 he founded his first large laboratory at Germantown, Pa., but in 1896 removed to Chevy Chase, Montgomery Co[unty], Md., a near suburb of Washington, D. C, where he has built and equipped the most extensive and best furnished series of private laboratories in this country. Laboratory No. 1. a two-story building, 190x30 ft., is devoted mostly to physical and psychologic experimentation; No. 2 is devoted to acoustics and music; Nos. 3 and 4. recently completed, are devoted respectively to electricity and chemistry and metallurgy; while two others are projected—the series completing facilities for research along the six lines of psychlogic inquiry. The apparatus in these buildings is valued at a figure well over $200 000.

Prof. Gates is a member of the American Microscopical society; of the Washington Microscopical Society; and of the Philosophical Society; the Society of Philosophical Inquiry, and the Anthropological and Mycological societies, all of Washington. He has frequently lectured on his discoveries; has contributed papers to several educational and philosophical journals, and has now (1899) in preparation an exhaustive account of his quarter-century of psychologic and psychurgic research. He was married, in 1894. to Phebe, daughter of Capt. M. C. Edson, of Washington, D. C. They have two sons and one daughter, whose exceptional development confirms Prof. Gates' theories of child rearing.