J. P. Guilford

(1897–1987)

J. P. Guilford died of natural causes at the age of 90 in Los Angeles on November 26, 1987. He is survived by his wife, Ruth, his daughter, Joan S. McGuire, three grandchildren and three great-grandchildren. He was born on a farm near Marquette, Nebraska on March 7, 1897, the son of Edwin and Arvilla Monroe Guilford. In 1914, he was graduated from Aurora High School as Valedictorian of his class. After teaching elementary school for two years, he attended the University of Nebraska for a year, entered the Army as a private, and after being discharged returned to complete his BA and MA at Nebraska. During this period he served as interim director of the Psychology Clinic where he administered intelligence tests to children. Although he became familiar with Spearman's *g*-factor theory of intelligence, he was impressed with the unevenness of children's abilities in different areas. This convinced him that intelligence was not one monolithic, global attribute, but a composite of different abilities. At this point in his training, therefore, he was already showing a strong interest in what was to be the dominant focus of his professional career, individual differences.

In 1924, Guilford entered the psychology PhD program at Cornell University where he studied with such famous historical figures as Titchener, Koffka, Helson, and Dallenbach. When Guilford was awarded the PhD at Cornell in 1927, he had already published five papers. His doctoral thesis showed that variations in reported sensory experience with weak stimuli were due more to the characteristics of the limen itself than to fluctuations in attention, contrary to what was commonly believed at that time.

After short periods of time on the faculties of the Universities of Illinois and Kansas, Guilford returned in 1928 to the University of Nebraska as Professor of Psychology where he achieved international renown as one of America's foremost psychologists. In 1940, he moved to the University of Southern California. Except for a period of leave to serve in the US Army Air Corps during World War II, he remained at USC until his formal retirement in 1962. This event represented little more than a milestone in his career since he continued to be very active in research and writing for 25 more years. As a teacher, Guilford trained dozens of graduate students who went on to make numerous contributions of their own to the psychometric literature.

During a productive research career that continued for more than six decades, Guilford published over 25 books, 30 tests, and 300 journal articles. Some of the honors and awards bestowed upon him include the following: elected President of the Psychometric Society (1938), the Midwestern Psychological Association (1939), the Western Psychological Association (1946), APA Division 5, Evaluation and Measurement (1947), the American Psychological Association (1949), and APA Division 10, Aesthetics (1956); awarded the Legion of Merit for outstanding military service (1946); awarded honorary degrees by the University of Nebraska (1952) and the University of Southern California (1962); elected to membership in the National Academy of Sciences (1954); received the APA Distinguished Scientific Contributions Award (1964) and the Richardson Creativity Award (1966); elected President-for-Life of the International Society for Intelligence Education (1978); awarded the Gold Medal of the American Psychological Foundation (1983).

During the early years of his career, Guilford focused on such classical research topics in experimental psychology as attention, psychophysics, autokinetic phenomena, eye movements, scaling methods, and the phi phenomenon. The crowning achievement of this period, however, was the publication in 1936 of his classic textbook, *Psychometric Methods*, revised in 1954. This book became required reading for practically all psychology graduate students for decades and provided for the first time in one source an encyclopedic but readable exposition of psychophysical methods, scaling procedures, and even factor analysis. After the publication of this book, the focus of Guilford's research shifted more and more to the study of personality and ability traits.

L. L. Thurstone's *Vectors of Mind*, published in 1934, and related work on the primary mental abilities, provided a methodology which Guilford immediately began to apply to the study of personality. At the time, Jung's Extraversion-Introversion construct was generally believed to represent a single unitary dimension of personality. Guilford and his wife, Ruth, developed 35 questionnaire items to measure attributes commonly assumed to represent Extraversion-Introversion and subjected them to a factor analysis using Thurstone's new method. They demonstrated that Extraversion-Introversion was not one global trait but a complex composite of several distinct personality attributes.

This influential investigation was quickly followed by many other empirical studies of a similar kind which led to the identification of 13 important factors of personality. Three of these were measured in the first published factored personality inventory, The Nebraska Personality Inventory (1934). This line of research culminated in the publication of

the well-known Guilford-Zimmerman Temperament Survey (1949) and a scholarly book reviewing the personality literature from the factor analytic point of view, *Personality* (1959).

Guilford's new emphasis on correlational studies prompted him to give increased attention to statistical methods in his research and writing. In addition to developing many new statistical procedures of his own, in 1942 he published *Fundamental Statistics in Psychology and Education*, a popular textbook that was revised many times thereafter and is still in print today.

The arrival of World War II presented Guilford with a unique opportunity to apply his factor analytic methodology to the study of mental abilities. He had always believed that there are many important and relatively independent mental abilities. So, when he was asked to participate in the US Army Air Corps World War II research effort to develop psychological tests for the selection of pilots, bombardiers, and navigators, he had a philosophy and a methodology ready to apply to the task at hand.

From 1942 through 1945 he directed a factor analytically oriented test-development effort that dwarfed anything of this kind hitherto undertaken. He revolutionized job classification methods by factor analyzing criteria of performance along with the tests themselves to provide more information about the aptitudes necessary for successful job performance. By the end of the war, Guilford and his collaborators had identified and measured some 25 important mental ability factors. They used the selection tests developed in this research effort to reduce the failure rate in pilot training to one third of what it had been at the start of the war. This epic work, described in his book, *Printed Classification Tests*, set the standard for all subsequent selection programs both in and out of the military.

In 1945, he returned to teaching and research at the University of Southern California where he continued with his investigations into the mental abilities that make up intelligence. Guilford was particularly aware of the absence of creativity measures in conventional intelligence tests. His 1950 APA presidential address emphasized the need for more research into the nature of creativity. Over the next 20 years, he carried out numerous large empirical investigations that continued to expand the number of confirmed mental abilities. Many of these are related to creativity. Two major books on intelligence emerged from this period, *The Nature of Human Intelligence* (1967) and *The Analysis of Intelligence* (1971; with Ralph Hoepfner).

By the early 50's, Guilford began to feel the need to develop a system for classifying the many mental abilities that had been and were continuing to be discovered. The first version of his now-famous Structure of Intellect (SOI) model was presented in 1955 to an international conference on factor analysis in Paris. Since its first formulation, the SOI model has been the main focus of Guilford's research and writing. He has used the model to suggest where new abilities might be discovered, much as the periodic table had been used earlier to locate new chemical elements. The number of possible abilities represented by the model has increased over the years and in the latest version (to be described below) stands at 180.

As the SOI model developed, Guilford became more and more interested in applying it to improve education. Despite the widespread popularity of the IQ, Guilford never believed in the *g*-theory of intelligence. Furthermore, anticipating much recent controversy about the IQ concept, he doubted the immutability of mental ability. He believed that human abilities are differentiated into increasingly complex systems as a function of more and more education. He believed that children can be trained to be smarter; "Intelligence education is intelligent education," became his motto. His ideas in this area have been implemented in recent years, particularly in Japan, through the efforts of the

International Society for Intelligence Education. This society and its affiliated schools rest on the foundation of Guilford's SOI model. In these schools, students are trained, from early on, to upgrade their SOI abilities in thinking, creativity, and many other areas through weekly exercises.

In his latest version of the SOI, ("Some Changes in the Structure-of-Intellect Model," *Educational and Psychological Measurement*, Spring, 1988) Guilford described intelligence as being a systematic collection of a large number of abilities for processing different kinds of information in various ways. There are six kinds of operations (cognition, memory recording, memory retention, convergent production, divergent production, and evaluation), five kinds of contents (visual, auditory, symbolic, semantic, and behavioral), and six kinds of products (units, classes, relations, systems, transformations, and implications). The SOI model resembles a cube with contents, products, and operations each occupying one side. Each ability is defined by a conjunction of the three categories, occupying one cell in the three-dimensional figure. Many of these abilities are acknowledged to be correlated with each other. This $6 \times 5 \times 6$ figure yields a total of 180 possible unique abilities, over 100 of which have been empirically verified.

It is not easy to single out one achievement as Guilford's most important contribution. His outstanding books on psychometric methods, statistics, personality, and intelligence, his personality and ability tests, his Air Corps personnel selection work, his discovery of new mental abilities, and his structure of intellect model have all been extremely influential. What may be most enduring, however, is his influence on our way of thinking about intelligence. When Guilford began his career, intelligence was the IQ, a monolithic global trait that was regarded as largely innate and immutable. Now, in large measure as a result of his research, intelligence has been shown to be incredibly complex. There may be as many as 180 separate abilities that can be individually developed through "intelligence education". The hereditary limitations placed on human intelligence are seen now to be far less restrictive than previously assumed. Guilford's conception of intelligence, if adequately heeded, will have a profound impact in the future on public perceptions about individual potential and upon the education of children.

University of California, Los Angeles ANDREW L. COMREY
University of Southern California WILLIAM B. MICHAEL
University of Texas BENJAMIN FRUCHTER