MILL'S CANONS
PHILOSOPHY OF SCIENCE
SOFT DETERMINISM
SYSTEMS THEORY
THEORETICAL PSYCHOLOGY

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GALL, FRANZ JOSEF (1757–1828)

Born in Tiefenbrunn, Baden, Gall was a German physician who believed a correlation existed between mental abilities and the formation of the skull. Because he held that skull formation determines personality and behavior, he was charged with fatalism and hence with subverting religion. Consequently he was forced to leave Vienna, where he had settled in 1785, after completing medical studies at Strasbourg and Vienna.

His lectures in phrenology began in 1796, but by 1802 the Austrian government prohibited them. In 1805 he left Austria for an extended lecture tour to Germany, Holland, Sweden, and Switzerland. His fame peaked in Paris, where he settled as a physician in 1807. With his associate J. G. Spurzheim, he delivered an account of their research to the Institute of France, but that august body (which included Philippe Pinel and other notables) repudiated their report.

In the history of psychology, Gall is credited with being a pioneer in brain mapping or brain localization. Brain localization became accepted in psychology in 1861, when Paul Broca found the speech center in the brain. Phrenology's basic premise, however, was invalidated when it was discovered that the skull and the brain's topography do not accord, because the skull's thickness varies. Gall did, however, correctly identify the brain's gray matter with neurons and its white matter with ganglia or connective tissue.

Six volumes of Gall's writings were published as *Works: On the functions of the brain and each of its parts.* With Spurzheim, he published *Researches on the nervous system,* and *Anatomy and physiology of the nervous system.* His medical practice and research continued until his death at Montrouge, a suburb of Paris.

W. S. SAHAKIAN

GALTON, FRANCIS (1822–1911)

The father of differential psychology and one of the foremost progenitors of psychometrics, Galton was born into a wealthy English family, a half-cousin of Charles Darwin. Galton was a prodigy who could read and write at the age of three, but a problem pupil in school. After attending medical school and earning a degree in mathematics at Cambridge at 21, Galton fell heir to a family fortune that allowed him freely to pursue his scientific interests the rest of his long life, without need to earn a living. Strictly speaking, he could be regarded as a lifelong amateur inventor and scientist, but because he was also an authentic genius he made seminal contributions in a variety of fields: exploration and geography (of Africa), meteorology, photography, classification of fingerprints, genetics, statistics, anthropometry, and psychometry. His prodigious achievements and prolific publications brought him worldwide recognition and many honors, including knighthood, being named a Fellow of the Royal Society, and gold medals awarded by various scientific bodies in England and Europe.

Galton's contributions to differential psychology reflected his conviction that all human characteristics, both physical and mental, could ultimately be described quantitatively. This he believed a necessary condition for achieving a science of humanity. His motto was, "When you can, count." To promote quantitative thinking in the biological sciences, Galton and his disciple Karl Pearson founded the journal *Biometrika,* which continues to the present day.

Galton's long-term investigations of heredity culminated in *Natural inheritance* (1889), in which he anticipated the polygenic theory of inheritance of continuous characteristics later developed by Sir Ronald Fisher. But it was *Hereditary genius: An inquiry into its laws and consequences* (1869), that became Galton's best-known work and the one most relevant to psychology. He was the first scientist clearly to formulate the nature-nurture question—that is, the relative contributions of heredity and environment to individual and group differences in human traits, abilities, and talents. He was also the first to note the methodological importance of monozygotic and dizygotic twins for estimating the relative effects of genetic and environmental factors in human variation.

As intelligence tests had not yet been invented, in *Hereditary genius* Galton studied the inheritance of general mental ability by looking at nearly 1000 men who had achieved intellectual eminence and tabulating the frequency of eminent men among all their relatives. He found that as the degree of genetic kinship decreased, the percentage of eminent relatives also decreased in a markedly stepwise fashion, as one should predict from Galton's model of genetic inheritance, which also explained similar effects for indisputably hereditary traits such as stature and fingerprints, which Galton also investigated. From this, Galton argued that mental ability is inherited in the same fashion, and to much the same degree, as many physical traits. Stature, for example, also displayed Galton's "law of filial regression": the offspring of a deviant parent are, on average, less deviant from the mean of the population than is the parent regarding the trait in question.

Galton invented a number of sensory and motor tests, described in *Inquiries into human faculty and its development* (1883), and he tested thousands of the general public in his laboratory in the South Kensington Science Museum. He was the first clearly to put forth the idea of *general* ability and *specific* abilities later developed by Charles Spearman, and held that general ability was by far the more important influence on a person's life achievements. He viewed general ability as largely hereditary, with its distribution in the population following the normal or Gaussian curve.

Galton's contributions to statistics and psychometrics include formulations of regression and correlation, the bivariate scatter diagram, multiple correlation, standardized or scale-free scores, percentile ranks, the use of the median and geometric mean as measures of central tendency, and rating scales.

Galton devoted his last years to championing eugenics, and wrote a Utopian novel, *Kantsaywhere* (1910, unpublished), based on eugenic principles. In 1904 he founded and endowed the Galton Laboratory at the University of London, which, under the directorship of such luminaries as Karl Pearson and Sir Ronald Fisher, has been a leading center for research in genetics and statistics.

A. R. JENSEN

GAMBLING BEHAVIOR

In "Gambling," his introduction to the *Psychology of gambling,* a book edited by Jon Halliday and himself, Peter Fuller defined gambling as a redistribution of wealth on the basis of chance and risk, an event which always involves loss to one party and gain to another. In some gambling games, such as poker and blackjack, elements of skill combine with chance to influence the outcome of each play. In addition, basically nonrecreational activities such as stock and commodities transactions may serve on the one hand as vehicles of prudent investment, or on the other hand as outlets for irrational risk taking. Whether participation in events involving chance outcomes is simple recreation, reasonable risk taking, or irrational gambling seems to depend not so much on the nature of the game or transaction itself as upon the motivations and personality characteristics of the participant. The attention of behavioral scientists has focused on gambling because of the significant social, legal, and economic complications