Wilder Graves Penfield was born in Spokane, Washington, on January 26, 1891. He was one of three children born to Charles Samuel and Jean (Jefferson) Penfield. His father was a physician and died when Penfield was very young. To support herself and her family, Penfield's mother became a writer and Bible teacher. Penfield spent his early years at the Galahad School in Hudson, Wisconsin, where his mother worked as a housekeeper.

Upon graduation in 1909, Penfield was accepted at Princeton University. He was active in extra-curricular activities and became president of his class. He was so good at football, that upon graduation in 1913, he was hired as a coach. After graduation from Princeton with a degree in literature, Penfield held a Rhodes scholarship and a Beit Memorial Research fellowship at Oxford University, where he studied with Sir William Osler and Sir Charles Scott Sherrington. He married Helen Katherine Kermott in 1917 and eventually raised four children. Penfield received his medical degree from Johns Hopkins University in Baltimore in 1918. He worked in Sherrington’s research laboratory at Oxford from 1919 to 1921.

Penfield returned to the United States in 1918 to receive training in general surgery and neurosurgery in New York City. In 1924 he founded the Laboratory of Neurocytology at Presbyterian Hospital, Columbia University, and worked there as associate attending surgeon from 1921 to 1928. In 1928 he was appointed neurosurgeon to the Royal Victoria Hospital and the Montreal General Hospital. It was here that he perfected his surgical operation for severe epilepsy. He had learned, perfected, and adapted the many techniques used in this operation from visits to Europe he had made while at Montreal.

The results of one of these operations in 1931 gave Penfield the idea to write a general textbook regarding neurosurgery. Instead of writing it all himself, he decided to ask other specialists in this field to contribute to the book. The resulting book, Cytology and Cellular Pathology of the Nervous System (1932), turned into a three volume discussion of neurology. The collaboration that had produced the book gave Penfield the idea to create an institute furthered by the same cooperative techniques. He established the Montreal Neurological Institute on this idea and became its first director in 1934, holding this post until 1960. He was a professor of neurology and neurosurgery at McGill University from 1933 to 1954.

Penfield became a naturalized Canadian citizen in 1934 and served as a colonel in the Royal Canadian Army Medical Corps from 1945 to 1946. He headed many wartime projects including investigating motion sickness, decompression sickness, and air transportation of persons with head injuries. Penfield’s wartime experiences supplied two books; Manual of Military Neurosurgery (1941) and Epilepsy and Cerebral Localization (1941).

After the war he continued his studies on epilepsy by undertaking a study of the removal of brain scars resulting from birth injuries. He was a fellow of the Royal Society of London and of the Royal Society of Canada and received the Order of Merit from Queen Elizabeth (1953). He also received numerous scientific awards and lectureships. He helped found the Vanier Institute of the Family and served as its first president (1965-1968).

After his retirement from the Montreal Neurological Institute in 1960, Penfield set out on what he called his “second career” of writing and lecturing around the world. Not one to take to retirement easily, Penfield said “...rest is not what the brain needs. Rest destroys the brain.” He traveled abroad many times during this period and even lectured in China and Russia.

Penfield published The Difficult Art of Giving, The Epic of Alan Gregg (1967), a biography of the Rocke-
feller Foundation and the director who had approved the $1.2 million grant for the founding of the Montreal Neurological Institute, during this period. Second Thoughts; Science, the Arts and the Spirit (1970) and The Mystery of the Mind: A Critical Study of Conscience and the Human Brain (1975) were also published as he lectured around the world. Penfield finished his final work, the autobiographical No Man Alone: A Surgeon's Story, just three weeks before his death from abdominal cancer in Montreal’s Royal Victoria Hospital on April 5, 1976. This work was published posthumously in 1977 and was a fitting tribute to a man who was remembered by his friends and colleagues as one who always thought of his discoveries as just “exciting beginnings.”

**Medical research**

Penfield chose epilepsy as his special interest and approached the study of brain function through an intensive study of people suffering from this condition. In choosing this approach, he was influenced by Sherrington and by John Hughlings Jackson, a British neurologist who viewed epilepsy as “an experiment of nature,” which may reveal the functional organization of the human brain. To this study Penfield brought the modern techniques of neurosurgery—which allow the surgeon to study the exposed brain of the conscious patient under local anesthesia—while using electrical methods for stimulating and recording from the cortex and from deeper structures. The patient is able to cooperate fully in describing the results of cortical stimulation. By this surgical method it is possible in some patients to localize and remove a brain lesion responsible for epileptic attacks. Penfield used this approach primarily for the treatment of focal epilepsy. His pioneer work yielded impressive results, and his techniques for the surgical treatment of epilepsy became standard procedure in neurosurgery.

**Writings and theories**

Penfield’s *The Cerebral Cortex of Man* (1950) summarizes the results of mapping the principal motor and sensory areas of the cortex, including the delineation of a new “supplementary motor area” and a “second sensory area.” The results of temporal lobe stimulation are described in Epilepsy and the Functional Anatomy of the Human Brain (1954), and his remarkable observations on temporal lobe epilepsy are also recorded there. Penfield also defined four areas of the cortex concerned with human speech function and described them in *Speech and Brain-Mechanisms*.

Penfield was convinced that the brain of man—including all cortical areas—is controlled and “organized” through a group of subcortical centers. These centers lie within the upper brainstem and include the *thalamus*. For this functionally important area he coined the term “centrencephalon,” and his view may be described as a “centrencephalic” theory of cerebral organization. In his view consciousness, self-awareness, depends upon the integrating action of this subcortical system, which in some way, as yet unknown, unites the brain into a single functioning organ. There is much evidence for such a theory, and Penfield developed it in his Sherrington Lectures, *The Excitable Cortex in Conscious Man* (1958).

**Further Reading**


**Perception**

The area of psychology associated with the functioning of sensory systems and how information from the external world is interpreted.

Psychologists have identified two general ways in which humans perceive their environment. One involves what is called “top-down” processing. In this mode, what is perceived depends on such factors as expectations and knowledge. That is, sensory events are interpreted based on a combination of what occurs in the external world and on existing thoughts, experience, and expectations. When a perception is based on what is expected, it is called a perceptual set, a predisposition to experience an event in a particular way. One example of such a predisposition involves hearing potentially disturbing words or phrases when rock music is played backwards. Although most people will not detect such words or phrases when they first listen to the backward sounds (when they do not have a perceptual set), these same people will hear them quite clearly if they are then told what to listen for. Psychologists regard this process as involving a perceptual set because perception of the distressing message does not occur until the individual is primed to hear it.

**Motivation** can also influence the way an event is perceived. At sporting events, the same episode can be interpreted in exactly opposite ways by fans of two different teams. In this instance, people are interpreting the...