



Roger Wolcott Sperry

Nobel Laureate 1981

ON October 9 Roger Wolcott Sperry, Caltech's Hixon Professor of Psychobiology, was awarded the 1981 Nobel Prize in Physiology or Medicine for his discoveries concerning "functional specialization of the cerebral hemispheres." His work with split-brain patients, whose nerve fibers connecting the halves of the brain had been surgi-

cally severed, provided evidence that each brain half has its own perception, memory, and consciousness. Each hemisphere has its own character and function — the left half being verbal and mathematical and dealing with analytic and sequential reasoning, while the right half is spatial, conceptual, mute, and specializes in visualization and creativity. Sperry's research has shown that the functions of the right hemisphere are as important as those of the left, which had long been thought dominant. The greater understanding of the brain resulting from his work has relevance to education and philosophy as well as medicine.

Sperry's general field of behavioral biology (much less psychobiology) did not exist at Caltech in 1938 when Mrs. Frank P. Hixon established a fund in her husband's memory for studies of "salient and fundamental biology directly concerned with human behavior." Although she had been uncertain that money given to Caltech for her original purpose of "the correlation of mental or spiritual training with the scientific" would be fruitful, Mrs. Hixon was persuaded by Max Mason, then a member of the Caltech Executive Council. He wrote her that "this unique place" was just the right one to pursue fundamental *scientific* knowledge of behavior — that in the long run it was most promising to direct "the great forces of natural science into the new science of Man." Mason's foresight was confirmed when in 1954 a faculty committee headed by George Beadle brought Roger Sperry to the Institute to occupy the Hixon chair.

Sperry brought an already substantial reputation with him. Born in Hartford, Connecticut, in 1913, he attended Oberlin College (which also produced Robert A. Millikan, Caltech's first Nobel Prizewinner) where he was captain of the basketball team and also played varsity baseball, football, and track. He was quoted at the time he entered college as hoping to specialize in some area of science or medicine if he could find something of sufficient interest. He received his BA (English) from Oberlin in 1935 and MA (psychology) in 1937. In 1941 he earned his PhD in zoology from the University of Chicago, also another way station in Millikan's career. Sperry spent a year as a National Research Council Fellow in biology at Harvard and from 1942 to 1946 was a research associate at the Yerkes Laboratories of Primate Biology. During the war he also served as consultant to a government research project on the surgical repair of nerve injuries. He returned to the University of Chicago as assistant professor of neuroanatomy in 1946 and became associate professor of psychology there in 1952. In

1952-53 he also held a joint appointment at the National Institutes of Health as section chief for neurological diseases and blindness before his research attracted the attention of the Caltech committee looking for someone who fit both the Hixon description and Caltech's demands.

At Oberlin he had been a graduate assistant to R. H. Stetson, an international authority on the physiology of speech, who emphasized the biological aspects of psychology. Sperry's earliest publications in psychology were concerned with muscle coordination. Other early research dealt with the plasticity of the brain and functional recovery after injury to the nervous system. With experiments in nerve transplants in lower organisms he disproved the long-held theory that nerves are interchangeable and can learn new functions. He studied the developmental patterning of brain pathways, in which he demonstrated that neural networks are prewired according to a strict, genetically transmitted mapping system that is not subject to functional influence. Behavior (in the sense of visual perception) was shown to correlate precisely with these patterns of nerve connection. To explain these prewired networks Sperry developed the theory that growing nerve fibers are chemically "labeled" early in development and form connections with each other by recognizing complementary labels on their surfaces.

In the mid-1940s his interest turned to the organization of the mammalian brain, and he adapted to cats and monkeys the delicate microsurgical techniques he had developed earlier to study amphibian brains. With graduate student Ronald Myers, Sperry, now at Caltech, grew particularly interested in the corpus callosum, a cable of 200-million nerve fibers connecting the two halves of the brain. The function of this cable was unknown until Sperry and Myers began their experiments on the possible role of the corpus callosum in transferring information from one hemisphere to another in the brain of a cat. With their corpus callosa surgically split, cats trained to respond to information shown to one eye did not react when the image appeared only to the other eye. The corpus callosum apparently transferred at least visual information from one hemisphere to another. Subsequent experiments revealed an even more extensive function.

In humans it was thought that epileptic seizures traveled across the corpus callosum from one half of the brain to the other. Adapting Sperry's microsurgical techniques still further, Drs. Joseph E. Bogen and Philip J. Vogel succeeded in limiting the seizures of acutely debilitated epilepsy

patients by severing the connecting cable between the hemispheres. Sperry's subtle experiments with these split-brain patients, who seemed in most respects to function perfectly normally, led to the dramatic demonstrations that the two brain hemispheres in humans are distinctly different.

Over the past two decades Sperry's group has tested many split-brain patients. Differences in understanding and response from the two unconnected sides of the brain to visual, aural, and tactile clues disclosed the astonishing dissimilarities that are now well known. Continuing investigations have shown that the right side does have some language ability; implications of right- and left-handedness, as well as differences in thinking between the sexes, have also emerged from the research.

Sperry's work has attracted the interest of popularizers, and "left-brain" and "right-brain" have become common even to schoolchildren's vocabularies. Sperry finds this more amusing than troublesome, say his colleagues. He's an interesting teacher but prefers small lectures and is not a showman in class. Though a number of graduate students have worked in his laboratory, he does not work with large teams and is basically an individual researcher. It is characteristic that, when the Nobel Prize was announced, Sperry and his wife were camping and fishing in a remote part of Baja California and could not be reached for several days. The announcement, when it reached him, cannot have been too big a surprise, however; among his dozens of honors and awards, two years ago he received the Wolf Prize in Medicine and the Albert Lasker Basic Medical Research Award, which is often considered the harbinger of a Nobel.

In recent years he has turned more and more toward writing on the mind-brain relationship and the role of consciousness (and free will), which he perceives to have evolved as a directive and causal force in brain function. The unifying, functional role of subjective experience, according to Sperry, brings ethical values into the domain of science. He wrote this year in the *Annual Review of Neuroscience*:

Ideologies, philosophies, religious doctrines, world-models, value systems, and the like will stand or fall depending on the kinds of answers that brain research eventually reveals. It all comes together in the brain.

In 1968, 30 years after her original gift to Caltech, Mrs. Hixon wrote that Roger Sperry's work was leading exactly toward the goal she had hoped the Hixon fund might reach — "a knowledge of the 'why' in human behavior." □—J.D.