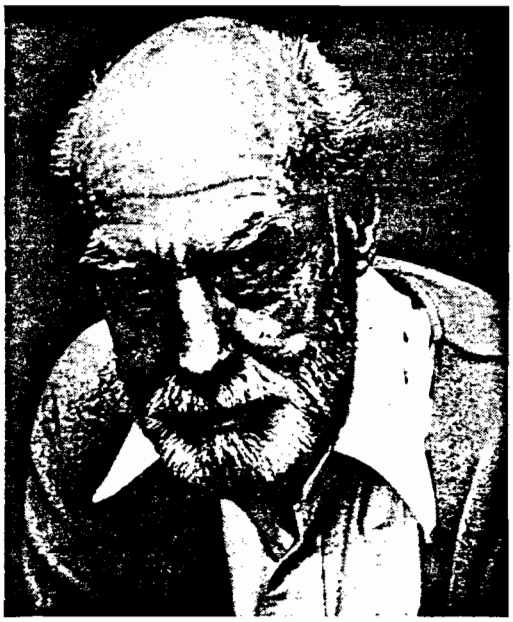
OBITUARY

Roger W. Sperry (1913–1994)

ROGER Sperry, co-winner of the 1981 Nobel Prize in Physiology or Medicine with Torsten Wiesel and myself, died on 17 April in Pasadena, California, of a heart attack. For many years he had suffered from a neuromuscular degenerative disease, but until recently had continued to be active in thinking and writing about the brain, consciousness and the mind. His contributions to neurobiology were titanic.

I first came across Sperry in the fall of 1953, when I heard him speak at an international physiological congress in Montreal. I had just begun my training in clinical neurology, and had not yet done any research. Sperry's talk came as a revelation.

It is hard today to recapture our state of knowledge of the nervous system in the early 1950s, a time when it was widely thought that the wiring of the brain came about largely through experience. In his talk, Sperry described the simple experiment of surgically interchanging the tendinous insertions of flexor and extensor muscles, or the nerves that supplied them, in a limb of a rat, to see whether the nervous system would relearn to use the muscles properly. The relearning never took place. Even the circuits responsible for spinal reflexes such as limb withdrawal in response to a painful stimulus to the foot remained quite unchanged.



Courtesy of Caltech

Sperry: titanic contributions to neurobiology.

A similar simplicity and lucidity characterized all of Sperry's work on neural development during that era. One of his best known developmental studies established that in a fish the fibres of a severed optic nerve grew back precisely to their former targets in the brain, even if at the time of severing the nerve the eye was rotated 180° in its socket. Here no adaptive relearning or rewiring of the circuits responsible for normal visual behaviour seemed to occur, so that the fish continued to snap downwards at bait placed above it. Such experiments suggested that when individual nerve fibres in a growing nerve trunk find their proper targets they do so by specific chemical cues that somehow recognize complementary cues in the targets. These ideas have still not been proven directly, but they have had a profound influence on the entire experimental field of neurodevelopment, today one of the most active branches of neurobiology.

In the 1950s the nervous system, and in particular the cerebral cortex, was supposed by some (who were taken seriously) to function not by nerve conduction and synapses but by a poorly spelled out process of electrical fields or waves in a volume conductor. Two experiments cleanly disposed of these ideas. In one, Sperry inserted into the cortex many tantalum plates or metal wires, which should have profoundly disturbed or short-circuited any such currents. In the second, he diced up the cortex with radially arranged pieces of insulating mica. In neither experiment was cortical function seriously disturbed. This was before Vernon Mountcastle's discovery of cortical columns, but Sperry did know of the predominance of radial cortical connections from the work of Santiago Ramón y Cajal and Lorente de Nó, and realized that the inserts should leave these connections relatively intact.

My next encounter with Roger Sperry was again indirect; in 1955 I found myself in the army and posted to Walter Reed Army Institute of Research, sharing a suite of laboratory cubicles with Ronald Myers, who had just got his PhD under Sperry at the University of Chicago. Myers's thesis topic involved behavioural studies of deficits resulting from severing the corpus callosum in cats. Up to that time, no one had any idea of the function of this huge bundle of nerve fibres, which connects the two hemispheres; together, Myers and Sperry showed that it had a very specific function in vision, and this was the beginning of the split-brain studies.

In the 1960s, Sperry, along with Joseph Bogen, Michael Gazzaniga and others, extended this line of research to humans. The work appeared first in two beautiful papers in *Brain*, in 1965 and 1967. Almost overnight a wealth of facts and concepts became available. The left hemisphere was known to be largely responsible for speech, but the new observations showed that the right hemisphere has language capabilities too, comprehending much of what it hears. It could even be shown that certain specific functions are better done by the right hemisphere than the left; for example the left hand (hence the right hemisphere) could carry out some visuospatial tasks far better than the right. In one marvellous passage we find a description of the right hand coming across and messing up what until then had been a successful three-dimensional drawing of a cube by the left hand. In these papers we learned that one person could have, literally at one and the same time, two consciousnesses.

Many of these ideas became distorted when they percolated down to the public, and one could easily get the impression that the right hemisphere was 'for' emotions and art, and that the left was 'for' reasoning and other dry intellectual pursuits. The original papers in *Brain* are the best antidote to such simplifications. They are highly readable and well within the grasp of a high-school student.

In later life, Sperry became increasingly interested in theories of mind and consciousness, concentrating on the relationship between mind and consciousness and ethical values. Many of his fellow neurobiologists could not easily follow his arguments, which seemed to come closer to philosophy than to neurology. But one could sympathize with his contention that brain mechanisms would never be understood solely on a basis of the chemistry and biophysics of single nerve cells. The revolution in these areas in the past generation has made it abundantly clear that without such a basis brain mechanisms are totally out of reach. Sperry's point was that more than chemistry and biophysics is required. It is like the relationship between chemistry of bricks and mortar, and the finished cathedral.

Our week together in Stockholm, in December 1981, with Torsten Wiesel, was marvellous fun. Our family and his were next-door neighbours at the Grand Hotel. In one lovely incident, just before the first banquet, a knock came at our door. It was Roger Sperry's son, holding an untied white bow tie in his hand. "Does anyone have any idea what to do with this?", he asked. I, of course, had no idea, because I have too little sense of style to use anything but the already-tied kind. But our youngest son, who plays the trumpet, had had to wear formal attire so often at concerts that he had become an expert in the difficult procedure. So Paul went next door and tied all the Sperry family's bow ties.

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