

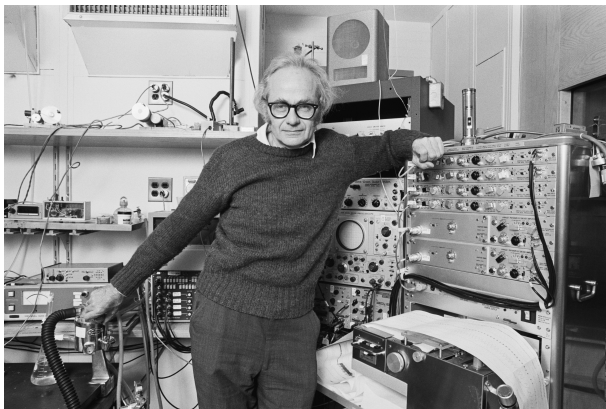
OBITUARIES

David Hubel

David Hubel, neuroscientist, and co-winner of 1981 Nobel prize

Ned Stafford *Hamburg*

David Hubel (b 1926; q McGill University, Montreal, 1951), died from kidney failure on 22 September 2013.



As a neuroscientist, David Hubel saw himself as an explorer. When he and his research partner, Torsten Wiesel, began investigating the visual processes of the brain in the late 1950s, they lacked hypotheses. In Hubel's own words, the work was "done in the spirit of Columbus crossing the Atlantic to see what he would find." The work was also done in the spirit of fun. "Research is largely fun," Hubel said in 2009, reflecting on his life and his work. "If it's not fun, I wouldn't do it." Indeed, Hubel and Wiesel sometimes were so excited after making one of their many discoveries that they would "run down the hall screaming with joy to tell and show (their colleagues)."

In 1981 Hubel and Wiesel, who first worked together at Johns Hopkins University and then at Harvard Medical School, were awarded one half of the Nobel prize in physiology or medicine for "their discoveries concerning information processing in the visual system."¹ Michael Greenberg, chair of the department of neurobiology at Harvard, describes Hubel's visual perception work as revolutionary, adding, "David was one of the great scientists of his generation."

Hubel started his collaboration with Wiesel in 1958 in the laboratory of Stephen Kuffler at Johns Hopkins. The next year Kuffler's entire laboratory moved to Harvard, and five years later became Harvard's department of neurobiology.

In the late 1950s little was known about the structure of the visual cortex or how electrical signals from the eyes were transformed in the brain into images. Scientists at the time generally thought visual information was simply projected point by point into the cortex, like a movie screen. By studying cats and monkeys, Hubel and Wiesel identified a sequence of visual processing in which visual signals are broken down and reconstituted as they travel through the brain.

They found that different neurons respond to highly specific visual cues. Some neurons are activated by horizontal lines, others by vertical lines, and others by particular axes in between. They learnt that neurons with similar functions are arranged together in columns and also organised by whether they receive information from the right or left eye, contributing to binocular vision.

Their first joint paper, *Receptive fields of single neurones in the cat's striate cortex*, was published in October 1959 in the *Journal of Physiology*.² As with subsequent papers, the two researchers wanted it to be as close to perfection as possible. They handed the manuscript around to Kuffler and other colleagues "to read and tear apart." The manuscript went through 11 drafts. Hubel, widely recognised as a superb writer able to simplify complicated research findings, was the main author. In 2009 the *Journal of Physiology* published a 50th anniversary issue dedicated to the "classic paper."³

In a later experiment Hubel and Wiesel sewed shut one eye of kittens at birth, and found that the corresponding area in the visual cortex permanently atrophies.⁴ Their work led to a recommendation that strabismus in humans be treated before age 2, while the brain is still able to adapt to the adjusted eye position. It also provided insight into the understanding and treatment of conditions such as deprivation amblyopia ("lazy eye") and childhood cataracts.

Nobel laureate Eric Kandel, who described the Hubel-Wiesel pairing as one of the most remarkable in contemporary science, recently wrote, "David and Torsten did more than open up the study of the primary visual cortex; they laid the basis of all that was to follow in the sensory systems. Together this body of work stands as one of the great biological achievements of the 20th century."

David Hunter Hubel was born in 1926 in Ontario, to American parents. As a child he loved science, especially electronics and chemistry, and also music, learning to play the piano.

He studied mathematics and physics at McGill University, graduating in 1947. Accepted to both graduate school in physics and to medical school, he finally—after much fretting—opted for medicine. During his second year of medical studies at McGill, he introduced himself to Wilder Penfield and Herbert Jasper of the Montreal Neurological Institute, where he “began to develop a strong interest in the brain.”

After earning his medical degree in 1951 he trained in hospitals in Montreal. “To my surprise I also found I enjoyed clinical medicine,” he wrote in his Nobel prize biography. Then he quipped, “It took three years of hospital training after graduation, a year of internship and two of residency in neurology, before that interest finally wore off.”

After moving to Baltimore in 1954 for a neurobiology fellowship at Johns Hopkins, he was drafted into the US Army medical corps and assigned to the neuropsychiatry division of the Walter Reed Army Institute of Research. His main assignment was to try to measure the spontaneous firing of single cortical cells in sleeping and waking cats, for which he first spent a year developing an implantable tungsten microelectrode.⁵ His work at Walter Reed laid a firm foundation for his later collaboration with Wiesel.

While Hubel remained affiliated with Harvard for the rest of his life, Wiesel moved in 1983 to Rockefeller University in New York City. In 1988 Hubel published the book *Eye, Brain and Vision*, which describes the visual process and related research from 1950 to 1980.⁶ In 2004 Hubel and Wiesel coauthored a book about their partnership: *Brain and Visual Perception: The Story of a 25-year Collaboration*.⁷

Hubel’s wife of nearly 59 years, Ruth, died in February 2013. He leaves their three sons, and four grandchildren.

- 1 The Nobel Prize in Physiology or Medicine 1981. http://www.nobelprize.org/nobel_prizes/medicine/laureates/1981/
- 2 Hubel DH, Wiesel TN. Receptive fields of single neurones in the cat’s striate cortex. *J Physiol* 1959;148:574-91. <http://jp.physoc.org/content/148/3/574.full.pdf+html>
- 3 Robertson B. A celebration of the 50th anniversary of David Hubel and Torsten Wiesel’s Receptive fields of single neurones in the cat’s striate cortex. *J Physiol* 2009;587:2721-32. <http://jp.physoc.org/content/587/12/2721.full>
- 4 Hubel DH, Wiesel TN. Effects of visual deprivation on morphology and physiology of cells in the cat’s lateral geniculate body. *J Neurophysiol* 1963;26:978-93. <http://jn.physiology.org/content/26/6/994.full.pdf+html>
- 5 Hubel DH. Tungsten microelectrode for recording from single units. *Science* 22 March 1957;125:549-50. <http://www.sciencemag.org/content/125/3247/549.extract>
- 6 Hubel DH, Wiesel TN. *Brain and visual perception: the story of a 25-year collaboration*. New York: Oxford University Press, 2004.
- 7 David Hubel’s eye, brain, and vision. <http://hubel.med.harvard.edu/>

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