NYU's Movshon winner of 'Golden Brain' award for research on the neuroscience of vision

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The award, now in its 29th year, recognizes outstanding contributions in vision and brain research.

Movshon, a faculty member in NYU's Center for Neural Science and Department of Psychology, will receive the award on Nov. 9—during the Society for Neuroscience's 43rd annual meeting in San Diego, California.

Director of NYU's Center for Neural Science, Movshon predicted and discovered the existence of neurons in the brain that enable global motion perception, which is at work when we process the complex visual scenes that surround us.

For instance, imagine a cheetah ambling through its natural habitat of shrubs and tall grasses. The individual spots on its legs and torso may appear to bounce around in different directions, but it's clear that the animal is moving in only one direction. So we perceive not only the local movements of individual parts of a moving object, but also the global motion of the entire object.

"I was looking for what I considered to be the Holy Grail," Movshon said. "No one else had ever used perceptual evidence as the basis for a search for neurons involved in a higher-order stage of visual cortical analysis."

When Movshon embarked on his ground-breaking research several decades ago, it was known that a given neuron in primary visual cortex (V1), the cortical area in the brain where visual information is first processed, responds to motion within a small part of the visual field. As a result, V1 neurons are well suited to process the local motion of individual components of an object. But nothing was known about where global motion was processed in the brain.

In the 1980s, Movshon and his collaborators discovered the existence of neurons involved in global motion perception in a higher-order motion area called MT, or V5. This visual cortical area receives V1 signals, which convey local motion information, and combines them to process global motion across larger regions in space.

"It was quite controversial for a while whether this was really important and told us something fundamentally new and interesting about how we see motion," Movshon said. "Ultimately, over the test of time, it's won the day, and it's now part of people's default way of thinking about motion processing in the cortex. It is also a standard model for how higher cortical areas take other kinds of information from V1 and reorganize it to reveal complex features of images."

Movshon and his collaborators also conducted pioneering experiments in which they recorded from individual neurons in MT and compared their responses with behavioral performance on psychophysical tasks involving motion discrimination. As reported in the Journal of Neuroscience in 1992, they discovered a close match between the two; the activity of single neurons was sufficient to predict behavioral performance.

In addition to his critical contributions regarding the neural basis of motion perception, Movshon published a trio of groundbreaking papers in the Journal of Physiology in 1978. In those classic studies, he and his collaborators used quantitative models to describe the responses of two types of V1 neurons known as simple cells and complex cells.

"Tony was the first person to really take the methods of linear systems analysis and do quantitative measurements on simple and complex cells in V1," said Bill Newsome, professor of neurobiology at Stanford University and former Golden Brain Award recipient. "This is really foundational work for thinking about models of cellular processing of visual information, and it has influenced many subsequent generations of visual and sensory physiologists as a model of how to characterize early sensory systems in a quantitative fashion."

Movshon continues to pursue an active and wide-ranging research program. Earlier this year, he and his collaborators published a study in *Nature Neuroscience* in which they identified a new functional role for V2, a major area in visual cortex that had remained mysterious despite years of research. They found that V2 neurons respond to naturally occurring texture patterns in a way that V1 neurons did not, suggesting how these cells may contribute to our ability to perceive visual scenes.

Throughout his career, Movshon has been a preeminent expert in neurophysiological techniques as well as psychophysics and computational methods.

"For a couple of decades, Tony was the leading figure in vision research for understanding the mammalian visual system and how the brain helps us see, and he was the one person in the world who best combined competence in all three of those approaches," Newsome said.

Movshon's far-reaching impact in the field of visual neuroscience stems in part from his commendable personal traits, according to Newsome.

"Tony is uncompromising in his sense of quality and his rigorous approach to designing experiments," he said. "Many scientists try to use very high standards of evidence, but Tony holds himself and others to even higher standards. I've always admired that about him."

Later this month, Movshon will receive the American Philosophical Society's 2013 Karl Spencer Lashley Award in recognition of his "pioneering work on the neuroscience of vision."

Provided by New York University

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