



# GRUBER FOUNDATION

**US Media Contact:**

Alyson O'Mahoney  
+1 (914) 241-0086 ext. 13  
aomahoney@robinleedyassociates.com

Online Newsroom: [www.gruberprizes.org/Press.php](http://www.gruberprizes.org/Press.php)

**Foundation Contact:**

Bernetia Akin  
+1 (340) 775-8035  
media@gruberprizes.org



**John O'Keefe**

\*\*\*\*\* FOR IMMEDIATE RELEASE

## O'KEEFE RECEIVES \$500,000 GRUBER NEUROSCIENCE PRIZE FOR THE DISCOVERY OF PLACE CELLS AND THEIR KEY ROLE IN COGNITION

\*\*\*\*\*

New York, NY, June 19, 2008 -- John O'Keefe, PhD, Professor of Cognitive Neuroscience at University College London, is the recipient of the 2008 Neuroscience Prize of the Peter and Patricia Gruber Foundation for "his pioneering work concerning the neural basis of complex cognitive functions in freely moving animals."

O'Keefe will receive the Gruber Neuroscience Prize on November 16, 2008, during the annual meeting of the Society for Neuroscience in Washington, D.C. The prize consists of a gold medal and \$500,000. O'Keefe will deliver the Peter and Patricia Gruber Lecture entitled "The Role of Theta Oscillations in Spatial Processing in the Hippocampal Formation" immediately following the award ceremony.

"The discovery of *place cells* and their abstract mnemonic properties was a vital milestone in the development of the field of cognitive neuroscience," reads the Gruber citation. "John O'Keefe's work inspired the research of many others in the field of memory and served as an example of the application of physiological and computational approaches to the understanding of behavior."

"John O'Keefe's astounding discovery explains how the brain makes us find the way from point A to B along a tortuous and complex path. We then need to remember a sequence of different places to pass – all in appropriate order. Each place cell serves as a sign-post that tells us how far we have reached along the path" says Sten Grillner, MD, noted neuroscientist at Sweden's Karolinska Institute and chair of Gruber's Neuroscience Selection Advisory Board.

"The ability to remember the path to any important location, spatial navigation, is an indispensable property of the nervous system of practically all animals, without which there would be chaos. It also tells us about key aspects of learning which may have critical importance in understanding human disorders such as memory loss," Grillner adds.

Place cells are nerve cells, or neurons, located in the hippocampus, a seahorse-shaped structure in the center of the brain that plays a major role in spatial navigation and memory. These neurons fire at a high rate when an animal occupies a part of an environment corresponding to the cell's *place field*. Different cells respond to different locations in the environment. In his 1971 paper with Jonathan Dostrovsky, O'Keefe first described the existence of place cells and first suggested the hypothesis that place cells might form the basis of a cognitive map of the environment. The cognitive map theory was extensively elaborated in *The Hippocampus as a Cognitive Map*, the classic 1978 book written with Lynn Nadel of the University of Arizona.

In their experiments, O'Keefe and his colleagues have found that the mapping system creates the sense of place by integrating information from different environmental landmarks such as walls and corners together with information from the animal's own movements as it navigates around the environment. Knowing how far the animal has moved in a particular direction allows the hippocampus to keep track of an animal's position even in the dark.

-more-





Work in many laboratories around the world has revealed the existence of other types of spatial cells including ones coding for direction and distance, has identified some of the environmental cues used by place cells, and has begun to uncover aspects of the synaptic plasticity and cellular pathways which enable the hippocampus to remember places in the environment.

O'Keefe's own lab has identified both short-term and long-term memory properties of these cells. For example, hippocampal place cells initially treat slightly different environments as identical but, with experience, can learn to differentiate between them and can store this memory for long periods of time. In cases of environmental uncertainty, the cells sometimes act as a group of individuals, each deciding on the animal's location independently of its neighbors. Under other circumstances, the place cells act collectively and identify the environment as an ensemble. According to computational theory, this cooperative behavior would be a particularly attractive feature for a memory system.

O'Keefe has recently become interested in applying the extensive knowledge of place cell behavior and hippocampal spatial function to the study of diseases of memory, in particular Alzheimer's disease. He and his colleagues have recorded hippocampal units in a mouse model of Alzheimer's during a spatial memory task. They have found a deterioration in the spatial information content of place cells in aged but not in young transgenic mice which correlated with the animals' impairment on the memory task and also with plaque burden in the hippocampus, a neuropathological sign of Alzheimer's. "We think that this will be a good model for the study of the development of the disease and for assessment of potential treatments," O'Keefe says.

The Gruber Foundation also funds the International Research Award in Neuroscience each year, to help support promising young neuroscientists to pursue education and research at a center of excellence in their field. A Society for Neuroscience committee selects two recipients, both young scientists who have demonstrated international collaboration based on the best science, to share equally the \$50,000 Gruber fellowship. The award will be presented at the SfN Annual Meeting.

### **Additional Information**

The official citation reads:

*The Peter and Patricia Gruber Foundation is proud to present the 2008 Neuroscience Prize to John O'Keefe for his pioneering work concerning the neural basis of complex cognitive functions in freely moving animals. His seminal discovery that neurons of the hippocampus respond selectively to the animal's spatial location enabled him and his colleagues to develop a theoretical framework and computational models for how the hippocampus participates in memory, and to validate these ideas empirically in rodents and humans.*

*The discovery of place cells and their abstract mnemonic properties was a vital milestone in the development of the field of cognitive neuroscience. John O'Keefe's work inspired the research of many others in the field of memory and served as an exemplar of the application of physiological and computational approaches to the understanding of behavior.*





### Laureates of the Gruber Neuroscience Prize:

- 2007: **Shigetada Nakanishi**, for pioneering research into communication between nerve cells in the brain
- 2006: **Masao Ito** and **Roger Nicoll**, for work on the molecular and cellular bases of memory and learning
- 2005: **Masakazu Konishi** and **Eric Knudsen**, for work on the neural basis of sound localization
- 2004: **Seymour Benzer**, for applying the tools of molecular biology and genetics to the fruit fly, *Drosophila*, and linking individual genes to their behavioral phenotypes

### 2008 Gruber Neuroscience Prize Selection Advisory Board Members:

- **Carol A. Barnes**, PhD, University of Arizona
- **Colin Blakemore**, Professor, University of Oxford
- **Linda S. Buck**, PhD, Fred Hutchinson Cancer Research Center
- **Sten Grillner**, Professor, Karolinska Institute
- **H. Robert Horvitz**, Professor, Massachusetts Institute of Technology
- **Donald Price**, Professor, Johns Hopkins University School of Medicine
- **Li-Huei Tsai**, Professor, Massachusetts Institute of Technology

**The Gruber International Prize Program** honors contemporary individuals in the fields of Cosmology, Genetics, Neuroscience, Justice and Women's Rights, whose groundbreaking work provides new models that inspire and enable fundamental shifts in knowledge and culture. The Selection Advisory Boards choose individuals whose contributions in their respective fields advance our knowledge, potentially have a profound impact on our lives, and, in the case of the Justice and Women's Rights Prizes, demonstrate courage and commitment in the face of significant obstacles.

\* \* \*

The Peter and Patricia Gruber Foundation honors and encourages educational excellence, social justice and scientific achievements that better the human condition. For more information about Foundation guidelines and priorities, please visit [www.gruberprizes.org](http://www.gruberprizes.org).

\* \* \*

**For more information on the Gruber Prizes** email [media@gruberprizes.org](mailto:media@gruberprizes.org) or contact Bernetia Akin of the Gruber Foundation at +1 (340) 775-8035 or by mail 140 W 57th St Suite 10C New York, NY 10019.

Media materials and additional background information on the Gruber Prizes can be found at **our online newsroom**: [www.gruberprizes.org/Press.php](http://www.gruberprizes.org/Press.php)

-end-

