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Eve Marder

Eve Marder to Receive the $500,000 Gruber Neuroscience Prize for Pioneering Contributions to the Understanding of Neural Circuitry

June 10, 2013, New Haven, CT - Eve Marder, PhD, a professor of neuroscience at Brandeis University, is the recipient of the 2013 Neuroscience Prize of The Gruber Foundation. Marder is being honored with this prestigious international award for her pioneering contributions to the understanding of neural circuits, particularly how the properties and dynamics of neural circuits give rise to specific behaviors.

The award will be presented to Marder in San Diego on Nov. 10 at the 43rd annual meeting of the Society for Neuroscience.

"Eve Marder has made a number of remarkable and groundbreaking discoveries that have fundamentally changed our understanding of how neural circuits operate and produce behavior," says Carol Barnes, chair of the Selection Advisory Board to the Neuroscience Prize. "She has also been an exceptional leader outside the laboratory, working tirelessly to bring people together to improve scientific research, policy, and education."

Marder's seminal discoveries about neural circuits have arisen from her research on a very small nervous system, the stomatogastric ganglion (STG) of lobsters and crabs. The STG system controls the rhythmic muscle contractions that grind and move food through the crustaceans' gut, and is considered similar to the neural circuits that control breathing and other rhythmic functions in humans. Early in her career, Marder revealed that the STG was not "hard-wired" to produce a single pattern of output, but that it was a remarkably plastic circuitry that could change both its parameters and function in response to various neuromodulators while still maintaining its morphologic connectivity. This discovery marked a paradigm shift in how scientists viewed the architecture and function of neural circuits, including those in the human brain. It revolutionized the study of neuromodulators.

Marder is also recognized for helping to pioneer the expansion of theoretical neuroscience, which uses computational and mathematical tools to quantify what nervous systems do and how they operate. She collaboratively developed a major experimental tool known as the dynamic clamp, which allows scientists to introduce mathematically modeled synaptic or other conductances into biological neurons. The device is now used worldwide for the study of neural systems at the cellular and circuitry levels.

More recently, Marder's research has focused on how neural circuits maintain stability, or homeostasis, over long periods of time despite constantly reconfiguring themselves. This research has broad implications for the study of many neurological diseases linked to dysfunctional neural circuitry, such as schizophrenia, depression, epilepsy, post-traumatic stress disorder (PTSD), and chronic pain.

"So much of what we know about the complexity and flexibility of the mechanisms used by neural circuits to impact behavior can be traced directly back to Marder's landmark research," says Erwin Neher, Nobel Laureate and member of the Selection Advisory Board to the Neuroscience Prize. "She has had a tremendous impact across the field of neuroscience, and is very much deserving of this award."

Additional Information

In addition to the cash award, the recipient will receive a gold laureate pin and a citation that reads:

The Gruber Foundation proudly presents the 2013 Neuroscience Prize to Eve Marder for her contributions to understanding how circuit dynamics and behavior arise from the properties of component neurons and their synaptic connections.

Eve Marder has used the stomatogastric ganglion in crustaceans to reveal principles general to all nervous systems, including the fundamental finding that circuits can be functionally reconfigured by neuromodulators, even if fixed morphologically. With the insight that there are multiple plausible solutions for any given output, she developed circuit models and tools to explore their 'parameterscape', revealing the complexity of possible neural solutions. The implications of her work reach across neuroscience, including homeostatic mechanisms of plasticity.

Through her creative pursuits, she has inspired and guided both her trainees and her colleagues to appreciate how diversity can be compatible with robust network function.

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Laureates of the Gruber Neuroscience Prize:

- **2012: Lily and Yuh Nung Jan,** for their fundamental contributions to our understanding of both voltage-gated ion channels and neural development.
- **2011: Huda Y. Zoghbi,** for her pioneering work on revealing the genetic underpinnings of neurological disorders
- **2010: Robert H. Wurtz,** for pioneering work concerning the neural bases of visual processing in primates
- **2009: Jeffrey C. Hall, Michael Rosbash,** and **Michael Young,** for revealing the gene-driven mechanism that controls rhythm in the nervous system
- **2008: John O'Keefe,** for discovering place cells, which led to important findings in cognitive neuroscience
- **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

The Prize recipients are chosen by the Neuroscience Selection Advisory Board. Its members are: **Carol A. Barnes,** University of Arizona (Chair); **Ben Barres,** Stanford University; **Stephen Heinemann,** Salk Institute; **David A. Lewis,** University of Pittsburgh; **Erwin Neher,** Max-Planck Institute; **Leslie Ungerleider,** National Institute for Mental Health; and **Robert Wurtz,** National Institute of Health

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By agreement made in the spring of 2011 The Gruber Foundation has now been established at Yale University.

The Gruber International Prize Program honors individuals in the fields of Cosmology, Genetics and Neuroscience, 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 and potentially have a profound impact on our lives.

The Neuroscience Prize honors scientists for major discoveries that have advanced the understanding of the nervous system.

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For more information on the Gruber Prizes, visit www.gruber.yale.edu, e-mail info@gruber.yale.edu or contact A. Sarah Hreha at +1 (203) 432-6231. By mail: The Gruber Foundation, Yale University, Office of Development, PO Box 2038, New Haven, CT 06521.
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