MICHAEL SHADLEN, M.D., PH.D.

The brain acquires information from the environment through the senses. Unlike simpler animals that react immediately to such information, or not at all, our sophisticated brains allow us to ponder and cogitate. Higher brain function has imbued a capacity to interpret information to assess its significance in light of other knowledge, and to decide what to do about it. Thus, the process of decision making offers a window on complex mental functions. Neuroscientists are beginning to understand the brain mechanisms that underlie the formation of a decision from the evidence received through the senses. I will describe recent discoveries that we have made using a combination of behavioral, electrophysiological, and computational techniques. Interestingly, the neural computations that underlie decision making were anticipated during World War II by Alan Turing and Abraham Wald. Turing applied this tool to break the German navy's Enigma cipher, while Wald invented the field of sequential analysis. Besides mathematical elegance and winning wars, our experiments suggest that this computational strategy may lie at the core of higher brain function. The principles of normal brain function revealed by the study of decision making expose a path to new treatments for neurological disorders affecting our most cherished cognitive abilities.

To learn more about Michael Shadlen, please visit *www.stonybrook.edu/sb/mind* or *www.shadlen.org*

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"How do 'planning' neurons maintain a response determined by sensory input that came and went seconds ago? Which inputs affect the plan and how are they selected? These are the secrets of cognition."

—Dr. Michael Shadlen

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The Swartz Foundation was established by Jerry Swartz in 1994 to explore the application of physics, mathematics, and computer engineering principles to neuroscience, as a path to better understanding the mind/brain relationship.

To achieve these goals, the Swartz Foundation supports research at ten centers for theoretical neuroscience: The Salk Institute, California Institute of Technology, New York University, University of California at San Francisco, Brandeis University, University of California at San Diego, Cold Spring Harbor Laboratory, and most recently, Columbia, Princeton, and Yale universities. Targeted research projects range from experimental investigations of brain circuitry to computational modeling of large-scale neuronal networks to exploration of nonconscious mental processing—all utilizing physical and mathematical principles. The Swartz Foundation also organizes and sponsors neuroscience workshops and meetings. Core themes have included communication in brain systems, neurobiology of decision making, and large-scale neural network modeling; generally, the identification of principles of brain function and dynamics with relation to cognition and behavior.

Dr. Jerome Swartz co-founded Symbol Technologies, Inc. in 1975, and was its chairman of the board and chief scientist until retiring in 2004. Swartz received a B.E.E. degree from the City University of New York and a Ph.D. in electrical engineering from Brooklyn's Polytechnic University, where he was the recipient of National Science Foundation and Ford Fellowships.

Swartz is an expert in the allied engineering physics fields of electro-optics, laser systems, and optical design, with particular application to new product development. He is credited with more than 200 U.S. patents and 30 published papers. He is a member of the National Academy of Engineering and a Fellow of the IEEE. Under his leadership, Symbol Technologies was awarded the 1999 National Medal of Technology, the highest honor for technical innovation in the United States. Swartz is a board member of the Stony Brook Foundation and a member of the board of trustees at Cold Spring Harbor Laboratory, Polytechnic University, and University of California at San Diego.

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Howard Hughes Medical Institute

Department of Physiology and Biophysics

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