

Name of Organizer: Jason Carmel and Noam Harel

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Title of Symposium: Paired electrical stimulation to strengthen spared neural circuits after CNS injury

Description of submitted symposium (please limit to 2000 characters): After CNS injury, electrical or electromagnetic stimulation of the nervous system can augment plasticity of spared or latent circuits through focal modulation. While most stimulation paradigms target a specific region of the central nervous system, the effects of induced plasticity may spread to any of the various connections between the targeted region and other regions. This symposium presents evidence that by pairing stimulation at the origin and the termination of a neural circuit, specific connections can be modulated. This approach uses the principle of Hebbian plasticity and rules of spike-timing dependent plasticity that have been elucidated in basic neuroscience experiments. By altering paired stimulation timing, synaptic function can be modulated up or down. We also discuss the use of synchronized convergent inputs onto a common synaptic target as a way to modulate that target. We focus on paired stimulation of the motor system because of its importance in clinical neurorehabilitation. Thus, the symposium will address what we know about paired stimulation in motor systems of both humans and animal models, emphasize how it qualitatively differs from single-site stimulation, and discuss the many remaining gaps in knowledge that the field needs to address.

Length of time required for symposium?: 90 minutes

Additional Presenters (Limited to 4 additional presenters, list full name and email address) Please Note: Any Non-member speakers must receive prior approval from the Program Chair.: Eberhard Fetz, fetz@uw.edu Robert Chen, robert.chen@uhn.on.ca Dylan Edwards, dje2002@med.cornell.edu Monica Perez, perezmo@miami.edu

What is the role of each presenter?: Eberhard Fetz: spike-timing dependent plasticity in the primate corticospinal system. Robert Chen: Paired stimulation of subthalamic nucleus and motor cortex in Parkinson's disease Dylan Edwards: Modulation of H reflexes with motor cortex stimulation Monica Perez: spike-timing dependent plasticity in the human corticospinal system.

Objective 1: Describe how paired stimulation timing can modulate specific neural circuits through spike-timing dependent plasticity.

Objective 2: Identify other modes of paired stimulation modulation, including convergence of multiple inputs onto a common target.

Objective 3: Illustrate how current protocols can be optimized and translated for effective neuromodulation.