Sensation, Action, and Recovery: Rewiring the Injured Nervous System

March 17

Tuesday, 12:30 pm

Billings Building—Rosedale Room

SPEAKER:

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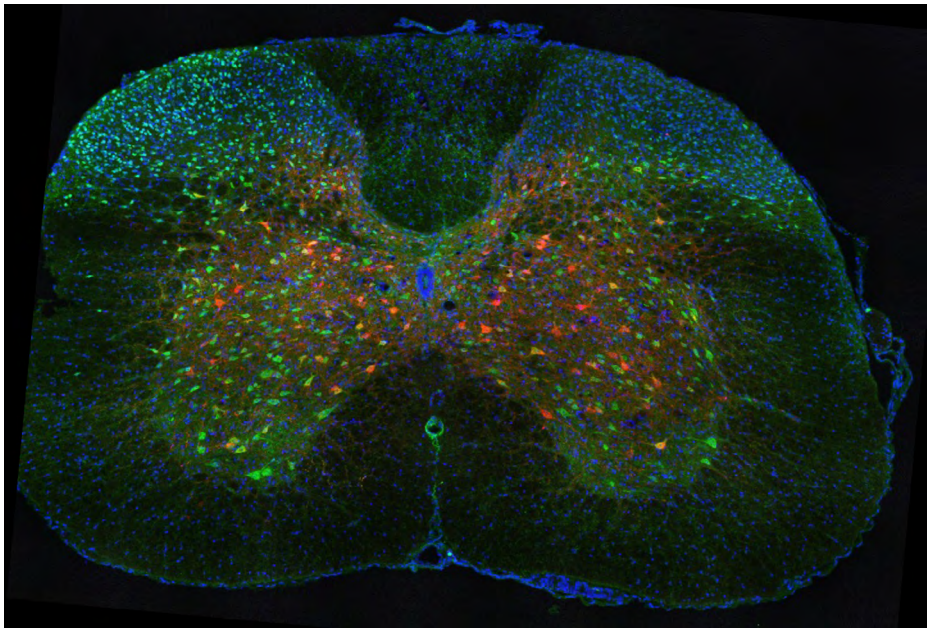
Abstract

Impaired movement is a hallmark of many neurological conditions including spinal cord injury. Critical functions such as breathing and locomotion depend on coordinated movements. Purposeful movements stem from continuous integration of sensory input with motor networks distributed across the central nervous system (Brain, brainstem, and the spinal cord). Injury induced disruption of these networks lead to profound impairments in motor control and significantly diminishing one's quality of life. Using a multidisciplinary approach combining electrophysiology, optogenetics, chemogenetics, in vivo calcium imaging, cell-type–specific anatomical mapping, and quantitative behavioral analysis, we demonstrate the neural circuit basis of movement and breathing. Our studies have identified sensory cortical pathways capable of driving movement independently of the motor cortex and revealed a critical role for cervical excitatory interneurons in enabling respiratory adaptation in both health and disease. I will present evidence demonstrating that targeting sensory cortical–locomotor pathways facilitate locomotor recovery after spinal cord injury. Moreover, neuromodulation of cervical excitatory interneurons improves breathing after spinal cord injury and the capacity to respond to acute respiratory challenges in health and after spinal cord injury. Together, these findings highlight novel therapeutic targets within sensorimotor circuits and suggest new strategies for restoring movement and breathing, thereby guiding future rehabilitation.



Publications

1. https://www.nature.com/articles/s41593-019-0536-7
2. https://www.nature.com/articles/s41586-018-0595-z
3. https://www.sciencedirect.com/science/article/pii/S0969996125002232?via%3Dihub

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