Joint Department of
BIOMEDICAL ENGINEERING

UNC CHAPEL HILL | NC STATE UNIVERSITY

Coulter Seminar Series Presents

Rehabilitation Engineering

Neural prostheses for restoring sensory and motor functions

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Akhtar and Bhutta Endowed Professor

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Doug Weber is a Professor in the Department of Mechanical Engineering and Neuroscience. Dr. Weber received a Ph.D. in Bioengineering from Arizona State University and completed post-doctoral training in the Centre for Neuroscience at the University of Alberta. His primary research area is Neural Engineering, including studies of motor learning and control of walking and reaching with an emphasis on applications to neurotechnology and rehabilitation medicine. Specific research interests include recording and interpreting neural signals to control assistive and prosthetic devices and neural stimulation to enhance sensory and motor functions.

ABSTRACT

Significant advances in materials and microelectronics over the last decade have enabled clinically relevant neurotechnologies that measure and regulate neural activity in the brain, spinal cord, and peripheral nerves. These technologies provide new capabilities for studying basic mechanisms of information processing and control in the nervous system, while also creating new opportunities for restoring function lost to injury or disease. Devices that measure the activity of sensory neurons can be used to monitor physical and physiological parameters, such as limb posture and movement or bladder volume and pressure, providing a natural source of feedback for controlling neural prostheses. Neural sensors can also measure the activity of motor neurons to enable direct neural control over prosthetic limbs and assistive technologies. Conversely, these neural interface technologies can stimulate activity in sensory and motor neurons to create sensory percepts and reanimate paralyzed muscles. Although many of these applications rely currently on devices that must be implanted into the body for precise targeting, ultra-miniaturized devices can be injected through the skin or vascular system to access deep structures without open surgery. Furthermore, improved and alternative technologies for sensing and stimulating neural activity through the skin are enhancing capabilities of wearable neurotechnologies for monitoring, rehabilitation, and training applications.

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