Training Opportunities

NCAN provides training in the theory and practice of adaptive neurotechnologies through a variety of courses, workshops, and symposia. It also provides on-site one-on-one training and research experience.

Short Course in Adaptive Neurotechnologies
This three-week NIH-sponsored Course provides young scientists, engineers, and clinicians with the multidisciplinary knowledge needed to guide the development of new adaptive neurotechnologies from conception through laboratory and clinical evaluation to dissemination and use for important scientific and clinical purposes.

BCI2000 Workshops: NCAN regularly offers workshops that focus on programming in this highly adaptable software programming environment and on applying it for experimental and clinical purposes.

Electrocorticography Workshops: NCAN offers workshops that highlight recent scientific, engineering, and clinical advances involving electrocorticography.

Spinal Cord Plasticity in Motor Control Symposium: Organized by NCAN and the National Center of Neuromodulation for Neurorehabilitation (NM4R) at the Medical University of South Carolina (MUSC), focuses on activity-dependent spinal cord plasticity in motor control and motor learning in health and disease (December 1 and 4, 2020).

Spinal Reflex Conditioning Workshops: NCAN and NM4R jointly present workshops that provide participants with the opportunity to learn scientific basis of spinal reflex conditioning and practice the fundamentals of human operant conditioning protocols.

Intramural Training Programs: NCAN offers training opportunities to visiting scientists and enables undergraduates (college and high school) to participate in research projects.

Contact us at **admin@neurotechcenter.org** to learn more about NCAN-supported training opportunities.

About NCAN

The National Center for Adaptive Neurotechnologies (NCAN) is located at the Stratton VA Medical Center in Albany (NY), and it is supported by the National Institute of Biomedical Imaging and Bioengineering of the National Institutes of Health.

NCAN scientists and engineers have developed a unique conceptual understanding of CNS plasticity and a technological infrastructure that together support and guide real-time interactions in which the technology and the CNS continually adapt to each other. The Center's work produces groundbreaking advances in the field of neurotechnologies, and translates them into effective new therapeutic and diagnostic methods to help people with spinal cord injury, stroke, cerebral palsy, epilepsy, and other devastating neurological disorders.

NCAN partners with many other laboratory and clinical researchers and with technology companies to create and validate novel neurotechnologies and disseminate them to scientists, engineers, and clinicians throughout the world. Contact us at admin@neurotechcenter.org to learn more about our research and opportunities for collaboration with NCAN.

www.neurotechcenter.org

NCAN
National Center for Adaptive Neurotechnologies

VA | U.S. Department of Veterans Affairs
Stratton VA Medical Center

Washington University in St. Louis
School of Medicine

MUSC
Medical University of South Carolina

NCAN researchers create, validate, and disseminate real-time adaptive neurotechnologies and protocols that interact with the central nervous system (CNS) to produce new scientific insights and to guide changes that improve function for people with neuromuscular disorders such as spinal cord injury, stroke, multiple sclerosis, cerebral palsy.

NCAN research has three areas of concentration.

Guiding Beneficial Plasticity

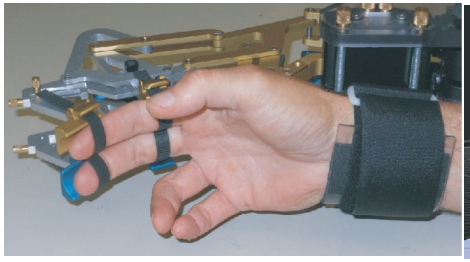
Spinal reflex operant conditioning protocols are among the first of a new generation of powerful therapies that target beneficial change to key nervous system pathways. Importantly, the beneficial change (i.e., plasticity) in these pathways leads to wider beneficial plasticity elsewhere. The result is that, in rats or people with incomplete spinal cord injury, operant conditioning of a spinal reflex increases walking speed and reduces limping.

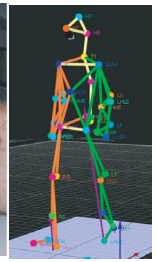
NCAN is now accelerating the pre-clinical development and clinical translation of operant-conditioning and related protocols by:

- validating a fully implantable telemetry-based system for long-term 24/7 operant conditioning in freely-moving rats;
- facilitating studies that elucidate the principles and mechanisms of ongoing CNS plasticity;
- creating new clinically practical conditioning protocols that can modify other CNS pathways and target modifications to specific phases of dynamic behaviors such as locomotion; and
- implementing and clinically translating robust, easy-to-use operant conditioning systems suitable for widespread use by clinicians and scientists.

Operant conditioning of CNS pathways is a major new therapeutic technology. NCAN is enabling its widespread dissemination for both basic research and clinical applications to enhance the success of neurorehabilitation for people with functional deficits caused by spinal cord injury, stroke, cerebral palsy, or other neuromuscular disorders.

BCI2000-Based Laboratory and Clinical System





NCAN scientists and engineers have developed BCI2000, a software platform that supports complex real-time closed-loop interactions with the CNS, operates with a variety of data acquisition hardware, and implements a wide range of adaptive neurotechnologies. Over the past 20 years, BCI2000 has been downloaded for use by over 6,000 researchers worldwide for real-time experiments, and has been used in studies reported in over 1,200 peer-reviewed publications.

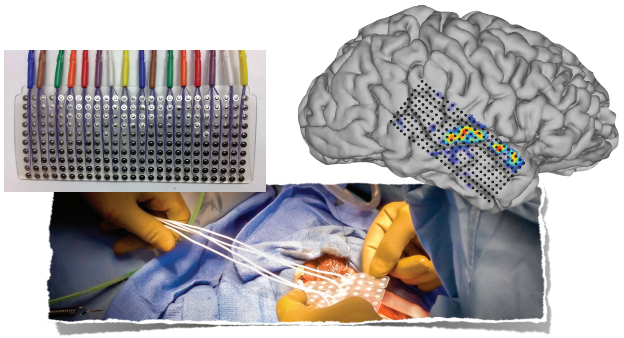
Currently, NCAN is developing BCI2000-based real-time data acquisition and experiment control systems that are broadly applicable to adaptive neurotechnology research and development. These include two highly adaptable systems that support laboratory or clinical investigations:

- A research system for small laboratory animals
  - Wholly implanted telemetry-based system
  - Supports long-term 24/7 interactions with the CNS
- A clinical system for real-time stimulation and recording
  - Enables detailed functional analysis of cortical/subcortical networks
  - Supports stimulating and recording through electrocorticographic (ECoG) and/or stereoencephalographic (SEEG) electrode arrays
  - Paradigm control by closed-loop feedback and other methods

NCAN and its external collaborators are validating and optimizing these systems.
The software, hardware specifications, and manuals of these new systems will be freely available on the NCAN website.

Characterizing and Modifying Cortical Processes

NCAN scientists and engineers are creating, validating, and translating into clinical use new analytical and stimulation methods that use electrocorticographic (ECoG) activity to characterize and interact with the brain processes responsible for essential behaviors such as attention.



Using our new techniques, we are developing and optimizing a new generation of adaptive neurotechnologies that use precisely focused ECoG-based electrical stimulation to induce predictable short-term and persistent changes in cortical network activity and in their subsequent behavioral manifestations. We are focusing on how stimulation-induced effects interact with moment-by-moment variations in cortical excitability to produce population-level responses.

The goal of these studies is to create a novel clinical system that maps brain networks and targets specific beneficial changes to restore cognitive or sensorimotor behaviors impaired by trauma or disease, such as stroke. NCAN scientists and engineers are validating and optimizing this system through collaborative projects with scientists at the University of California (Berkeley) and MIT.