DIRECTOR’S MESSAGE

The CNR recently received its third competitive award from the National Institute of Neurological Disease and Stroke (NINDS), marking its 11th continuous year of NIH funding. We are thankful for the confidence NINDS has expressed in reviews of our center. The success of the CNR has, in large part, been contingent on the many laboratories that make use of center cores.

A major change since the last newsletter is the addition of Dr. Kimberly (Kim) Maguschak as Center Manager. Kim represents the 4th such manager since the inception of the center; she has done a superb job of moving us forward in the new funding period. Her efforts and great management of center activities will undoubtedly make us even more competitive for the next grant renewal.

A major initiative during the past year has been the renovation of the CNR Behavior Core to add new and specialized testing rooms for assays of rodent behavior (funded by Tufts School of Medicine and a G20 grant to Dr. Phil Haydon). A more complete description of the renovated core is included in a later section of this newsletter. Coincident with renovation of the core, Dr. Jennifer Newman, Core Manager, applied for and received NIH instrumentation funding for the purchase of new behavioral testing equipment. This new equipment will greatly expand the capabilities of the core.

With the addition of new Neuroscience Departmental faculty during the past several years, CNR core facilities have evolved to meet the needs of Tufts neuroscientists. Most Tufts neuroscientists now utilize electrophysiological methods within their own labs, due to hiring of new faculty and as a consequence of existing faculty who have built new rigs with training and support of the CNR Electrophysiology Core. Thus, usage of this CNR core has waned, and it will be discontinued in the near future. Equipment and rigs will remain in the same departmental space and be available to Tufts neuroscientists. Please contact Drs. Kim Maguschak, Chris Dulla or Eric Frank for access to these facilities.

Going forward, new physiological facilities will be offered through the Behavior Core. For example, we have recently received a gift of rodent EEG recording equipment from AstraZeneca (kindly arranged by Dr. Steve Moss) that will be added to a new EEG facility within the Behavior Core. Please contact Dr. Chris Dulla for information about this new facility.

A new round of CNR Pilot grant awards was made recently, thanks to continued support from the Tufts Dean and Provost (see below). The center also continues its Core Award program, which provides limited funds to Tufts neuroscientists to explore new areas of research using CNR core facilities. Core Award applications can be submitted at any time and are reviewed on an ad hoc basis (see information about the Pilot and Core Awards within the CNR website).

Finally, as always, I thank the dedicated faculty and staff of the CNR for their efforts in the continuing evolution of center cores and activities. We are a successful center because of them. I invite you to explore the services offered by the CNR cores, which are available to all Tufts investigators.

Rob Jackson, Director, Tufts Center for Neuroscience Research
The aim of the Behavior Core is to provide area neuroscientists training in experimental design and neurobehavioral testing. Using instruments that can assess motor, sensorimotor, cognitive and emotional functions, the Core provides behavioral models for neuropsychiatric disorders that include anxiety, depression, drug and alcohol abuse, aggression, schizophrenia, and memory impairment. The Behavior Core is available to help in all steps of a study, including consultation for selection of the most appropriate assays, experimental design, behavioral testing, and data analysis.

The Behavior Core has recently been renovated.

The new area is located within the Department of Laboratory Animal Medicine (DLAM) on the third floor of the South Cove building (SC379). The facility is maintained under a reverse light cycle to enable testing during the rodent active period. In addition to the existing equipment, an elevated plus maze, two open fields, and four new light-dark transition frames will be available. The new equipment will be running on an updated MotorMonitor® software control package.
One room will be dedicated to the new operant conditioning suite, comprised of two independent operant systems with 8 operant chambers each. The new equipment is expected by the end of the summer. Each operant chamber will be equipped with a state-of-the-art touchscreen response panel and capabilities for liquid and food pellet delivery, intracranial self-stimulation and intravenous drug self-administration. Operant conditioning is based on goal directed behaviors and can be used to assess cognitive function, food reward, drug reward (oral and intravenous), and anhedonia associated with depressive disorders (intracranial self-stimulation).

Explore the many ways that operant conditioning applications can enhance your research program.


Please visit the *Behavior Core Calendar* to reserve equipment.

**GENOMICS CORE**

*Lax Iyer*, Genomics Core Manager

The CNR Genomics Core, located in Stearns 207A, is equipped with instruments and expertise for conducting gene expression studies. It contains instruments for nucleic acid analysis (Nanodrop and Agilent Bioanalyzer), and two Q-PCR machines (Stratagene real-time cyclers). Please sign-up to reserve time on the machines.

The CNR, in collaboration with the Tufts University and Tufts Medical Center libraries and the Tufts Technologies Services (TTS), has renewed the license for the Ingenuity Pathway Analysis (IPA) tool. IPA is a web-based tool that allows for the analysis and interpretation of experimental results, especially those arising out of high throughput studies such as microarrays and next generation sequencing. Neuroscience researchers can join the Tufts license by visiting the *Ingenuity website*.

CNR works with the TTS to maintain and update the latest suite of next generation sequencing analysis applications on the cluster. In addition, CNR also works with the Tufts Genomics Core to provide access to their sequencing services. Neuroscience researchers wishing to add next generation sequencing techniques to their research are encouraged to contact the Genomics Core Manager, *Lax Iyer*.

CNR plays an active role in the activities of the Tufts Computational Biology Initiative (CBI). Material from the hands-on genomics course and videos of the genomics symposium are available on the *CBI website*. **Genomic Core Calendars**

- Bioanalyzer
- Q-PCR

**Coming Soon**

- CBI is organizing a "Software Carpentry Bootcamp" to teach data analysis and programming to scientists.
- An annual genomics symposium is being planned.

For additional information contact *Lax Iyer*. 
With the arrival of the new Leica SPE, the imaging core now has three confocal microscopes. The Leica microscopes allow researchers to determine their own emission detection ranges, which gives more freedom than using the filter based systems. It also offers water immersion lenses for researchers that need longer working distances. The Nikon confocal has an automated stage and can perform stitching or multipoint imaging over time. Both Nikon systems have perfect focus which is very useful for live cell imaging over time.

The **Leica SPE** is perfect for standard slide imaging and is user friendly. The 20x lens on this system is not corrected for UV.

The **Leica SP2** is mostly in the upright position, but can be attached to the inverted microscope for live imaging. This system has applications within the software that guide users through FRET, FRAP, or lambda scans, but it is not set up to image in the UV range.

The **Nikon A1R confocal** is attached to an inverted microscope and has an automated stage. It can perform image stitching, or image multiple points over time. The A1R system also comes with a resonant scanner, in addition to our standard point scanner, which allows for high speed image acquisition. The presence of two scanners enables simultaneous photobleaching or photoactivation using the 405nm laser.

Finally, we also have an inverted **Nikon TIRF** system. This instrument can generate very thin optical sections (~200nm) just at the coverslip. Although this instrument is optimally used to image at the coverslip, the laser angle can be adjusted such that thicker sections are acquired. If you’re curious whether this instrument will work for you, come over with your samples and we can check!!

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Periodically check [Alenka Lovy’s website](#) for updates.
The Imaging Core also provides access to a Brightfield and Epifluorescence imaging facility located in Arnold room 309. This facility is equipped with three microscopes: the Zeiss Axioplan upright, the Nikon E800 upright, and the Nikon TE300 inverted. Both Nikon microscopes are connected to cameras and equipped with Nikon NIS Element software for image acquisition. The Nikon TE300 is mainly reserved for imaging live cell culture. The priority for the Nikon E800 upright microscope and software is for imaging acquisitions on sealed slides. The Zeiss Axioplan upright is for users to confirm their immunoreaction before image acquisition. If you are a new user for these microscopes, please contact Fanny Ng to schedule a brief 15 min to 1 hour training session prior to using them.

COMING SOON: ELECTROENCEPHALOGRAPHY FACILITY

Chris Dulla, Electrophysiology Core Co-Director

The CNR is excited to announce that we will be opening a new electroencephalography (EEG) facility soon. Housed within the renovated behavior core, the EEG facility will focus on studies of seizure activity and will provide equipment for implantation of EEG electrodes, EEG recording setups, and analysis software. The EEG facility will allow chronic (24/7) video/EEG analysis of seizure activity in mice, an essential part of any in vivo seizure experiment. As the EEG facility develops, we hope to work with investigators to provide assistance with other EEG-based studies focusing on sleep, autism, etc. We hope to be able to make performing high quality EEG recordings a relatively simple and straightforward experimental approach for any lab within the Tufts Neuroscience and larger Boston area. The EEG facility will be supervised by Dr. Chris Dulla; please contact him with questions and ideas regarding this exciting new component of the CNR.

UPDATES

To receive important updates from the CNR, please subscribe to the Behavior, Imaging, and/or Genomics Core Elists by emailing Kimberly Maguschak.

PILOT AWARDS 2014

We thank the Provost’s Office and the Medical Dean's Office for their generous contributions that make the CNR Pilot Award Program possible. For the past nine years, this program has provided funds to support collaborative projects amongst Tufts neuroscientists. The award recipients for 2014-2015 are:

Dr. Thomas Biederer, Dr. Michele Jacob, and Dr. Alexander Poltorak were awarded Pilot funds this year to support their project entitled “Role of innate immune responses in brain development and autism-relevant behaviors.” The group proposes to utilize wild-derived mice to determine the effects of immune activation on early brain development, social interaction, cognitive function, and synaptic properties. These studies will provide insight into the effects of elevated immune responses during early brain development. The CNR Behavior and Imaging Cores will be used to complete the project.

Dr. Dong Kong and Dr. Maribel Rios received a Pilot Award for their collaborative project entitled “The role of α2δ−1 in SF-1 neurons impacting glucose homeostasis.” Their proposal seeks to determine whether selective deletion of α2δ−1, a calcium channel subunit and thrombospondin receptor, has weight-independent effects on the regulation of glucose homeostasis in SF-1+ neurons in the VMH. Proposed investigations will make use of the CNR Behavior Core (indirect calorimetry, food intake, and activity monitoring) and Imaging Core (Confocal microscopy).

Congratulations to the recipients of this year’s Pilot Awards! Interested in submitting an application for the next cycle of awards? Please check the CNR website for dates and more detailed information.
FRESH FACES OF TUFTS NEUROSCIENCE FACULTY

Two researchers have recently joined the Tufts Neuroscience Department. Dr. Dong Kong from Beth Israel Deaconess Medical Center and Harvard Medical School and Dr. Thomas Biederer from Yale University. The CNR welcomes these new faculty who bring diverse knowledge and experience as well as great personality to the Neuroscience family.

The long-term interest of the Kong Lab is to bridge molecular, cellular, and system approaches to understand the neuronal modulation and circuitry involved in the pathogenesis of metabolism-related neurological diseases. By leveraging and combining several cutting-edge technologies ranging from genetically engineered mouse models, recombinant viral vectors and viral tracing systems, optogenetic and pharmacogenetic approaches, patch-clamp electrophysiology, 2-photon laser scanning microscopy, and 2-photon laser uncaging methods (2PLSM/2PLU), Dong’s group is interrogating three questions: 1) how neurons in the central nervous system translate their intrinsic firing properties to the controlling of feeding behaviors and metabolic regulations, and what circuits are involved; 2) how metabolic signals, including circulating metabolites, hormones, and neuropeptides, act on circuit neurons, shape their firing outputs, and modulate related synaptic neurotransmission; and 3) what kinds of molecules, ion channels, or cellular signaling pathways are necessary for these physiological processes and how their dysfunctions contribute to the pathogenesis of disorders in both metabolism and cognition. Their efforts to understand the above questions will greatly benefit from the strength of the cores of CNR, including the Imaging Facility, the Animal Behavior Research Core, and the Genomics Core. Outside of the lab, Dong loves hiking, photography, and golf.

The Biederer lab investigates the mechanisms that instruct synapse formation and remodeling to gain insight into how the connectivity of the brain is set up and how connections are re-wired by experience. The motivation for this work is that these processes are linked to human diseases, including autism spectrum disorders. His group has helped identify and characterize adhesion molecules that span the synaptic cleft and they use these proteins as entry points for studying synapse organization. On a molecular level, they have made strong headway toward defining the repertoire of these trans-synaptic interactions and revealed that they can successively function during axo-dendritic contact and synaptic differentiation. Expanding this research program to in vivo studies in genetically modified mouse models, they showed that these trans-synaptic interactions can control excitatory synapse number and maintenance in the brain. Ongoing research investigates how synapse-organizing proteins control activity-dependent remodeling of neuronal connectivity from sensory systems to cognition, and how different trans-synaptic complexes cooperate functionally. The CNR cores will be highly relevant to the Biederer lab due to its interdisciplinary approaches that integrate molecular, imaging, physiological and behavioral studies. As for Thomas’s life outside the lab, Boston appears to be a great fit. While some may consider Bostonians a bit gruff at first, Thomas has found his folding bike to be a great conversation starter.


