Welcome New Students!

Brian Barnett, University of Maryland-College Park
Korri Burnett, University of Michigan-Dearborn, B.S., University of Michigan-Ann Arbor, M.S.
Anjani Sreeprada Chakrala, Indian Institute of Technology-Madras [X. Huang Lab]
Taylor Keding, University of Wisconsin-Madison
Will Mayner, Brown University
Armand Meza, Virginia Tech University
Maeghan Murie-Mazariegos, Oklahoma State University
Charlene Rivera-Bonet, University of Puerto Rico-Cayey
Marisa Ross (N&PP), Duquense University
Whitney Stevens-Sostre, University of Puerto Rico-Mayaguez
Lowell Thompson, University of Wisconsin-La Crosse
Nick Vogt (MD/PhD), Swarthmore University [Bendlin Lab]

2016 Neuroscience Research Symposium Summary
By N&PP student Joshua Cruz (Kalin Lab)

Co-sponsored by the Neuroscience Training Program (NTP), Neuroscience and Public Policy Program (N&PP) and BioPharmaceutical Technology Center Institute (BTCI), the Neuroscience Research Symposium was held at the Promega Corporation in late August of this year.

The event started with a welcome address by NTP director Dr. Mary Halloran and Dr. Thomas Livelli, Vice President of Life Sciences Products and Services from the Promega Corporation where they commended the continuing collaboration between BTCI and the NTP for the opportunity to showcase faculty and student neuroscience research at UW-Madison.

In the first session, Dr. Bas Rokers spoke about examining the neural basis of visual agnosia and ways in which his lab are able to model cortical blindness in human and non-human primate

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Chadd Funk graduated from the Tononi lab and is now a medical student at UW-Madison. 
Rikki Hullinger graduated from the Puglielli lab and is now a Patent Scientist for Michael Best & Friedrich LLP.
Martina Ly graduated from the Bendlin and Davidson labs and is now a postdoc at UPenn.
Maia Pujara graduated from the Koenig lab and is now a postdoc at NIH.
Annie Racine graduated from the Sterling Johson lab and is now a postdoc at Boston.
Erika Starks graduated from the Bendlin lab and is now a medical student at UW-Madison.
Jingxin Wang graduated from the Li lab and is now a resident at Baylor.
Rick Wolf graduated from the Koenig and Herringa labs and is now a program director and scientist at Insight Data Science.
Brittany Young graduated from the Prabhakaran Lab and is now a medical student at UW-Madison.

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models using array of methods that stem from behavioral performance to electrophysiology. NTP student, Taehee Kim (Vemuganti Lab) enlightened the audience with his work on mouse models demonstrating that suppression of alpha-synuclein protein in the brain during an ischemic episode may reduce injury. Pharmaceutical Sciences student, Michelle Pizzo (Thorne lab), spoke about the difficulties of intrathecal drug distribution to the central nervous system and her efforts in discovering alternate methods of distributing targeted biotherapeutics to treat neurological disorders.

The second session topics ranged from the genetic underpinnings of altered organelle structure and function in hereditary spastic paraplegia (HSP) by Dr. Jon Audhya to NTP student Caitlin Short’s (Gomez Lab) work on utilizing 3D axon guidance methods to examine invadosome formation. NTP student, Scott Vermilyea (Emborg Lab), closed the session talking about utilizing marmoset skin cells to derive dopaminergic cells lines to study Parkinson’s disease.

Before the lunch break, the NTP welcomed back 1981 NTP alumnus, Dr. Thomas Reh, professor in the Department of Biological Structure at the University of Washington School of Medicine. After a presentation awarding Dr. Reh with this year’s Distinguished Alumni Award, the keynote presentation began with a special introduction from his former advisor, Dr. Katherine Kalil, where she spoke fondly of his time in her lab as her first trainee. In his talk, Dr. Reh spoke of his time in the NTP and how it has shaped his current work in researching the neurobiological mechanisms of retinal regeneration. With the talk’s slogan, “it’s never too late to change your fate”, he spoke of his promising research utilizing mouse models to describe the difficulties but not the impossibilities of regenerating retinal cells.

In the afternoon session, new NTP faculty trainer, Dr. Darcie Moore, highlighted how age effects the ability for stem cells to proliferate and ways in which her lab is trying to overcome the molecular barriers to turn old stem cells new again. Closing the session with talks from students in the dual degree programs, N&PP student Andrew Merluzzi (Bendlin Lab) talked about the utilization of advanced diffusion tensor imaging (DTI) techniques to study white matter integrity in Alzheimer’s disease. MSTP student, Daryl Fields (Baker Lab), spoke about understanding the mechanisms surrounding inactivity-induced respiratory plasticity through hypoxic conditions.

Towards the end of the symposium, Dr. Reh and a panel of invited NTP alumni spoke with students and answered questions regarding career paths in and outside of academia and industry. Closing out the day, a poster session was held showcasing the student research done by students affiliated with the NTP.

In all, the day celebrated the NTP’s commitment to cutting-edge innovation in neuroscience research, enthusiastic collaborations between students and faculty, and the ongoing impact that NTP alumni can have on the scientific community.

CONGRATS TO THE STUDENTS THAT HAVE RECENTLY PASSED THEIR PRELIMS!

Sara Berman        C.P. Frost        Corinne Jones
Drew Sheldon       Joe Wszalek, Esq.
Welcome New Faculty!

Darcie Moore
Assistant Professor, Department of Neuroscience
Neural stem cell aging

Jon Audhya
Associate Professor, Department of Biomolecular Chemistry
Organelle dynamics and neuronal trafficking; Neuronal control of motor function

Awards & Recognitions

Congratulations to the following students and faculty for their recent achievements:

Sarah Berman received a F30 NIH Ruth L. Kirchstein National Research Service Fellowship.
Craig Berridge received a UW WARF Named Professorship he chose the title Patricia Goldman-Rakic Professor of Psychology.
Inca Dieterich was awarded a slot on the Biology of Aging T32 Training Grant, funded by National Institute of Aging.
Sofiya Hupalo received the Anne E. Kelley Fellowship in Behavioral Neuroscience Travel Award and received the 2016 NTP Travel Award.
Margaux Kenwood was named as a WARF Ambassador.
Sisi Li received the 2016 NTP Travel Award.
Antoine Madar received the citizen United for Research in Epilepsy (CURE) Young Investigator Travel Award and the UW-Madison SRGC conference presentation Funds.
Andrew Merluzzi received a travel award to Alzheimer’s Association International Conference (AAIC) and was a chair for a scientific session at the conference.
Kate Sprecher was elected chair of the Gordon Research Seminar on Sleep Regulation and Function.
Scott Vermilyea received the 2016 NTP Travel Award.
Caitlin Warlick-Short received the 2016 NTP Travel Award.
Xinyu Zhao was titled Jenni and Kyle professorship in Neurodevelopmental Diseases.

Botulinum Toxin May Travel Further than Expected in Nerve Cell

By David Tenenbaum, UW-Madison News

The botulinum toxins are among the deadliest substances on Earth, and two specific toxins — including the popular drug Botox — have multiple uses for treating many neuromuscular conditions, including frown lines, disabling muscle spasms and migraine headaches.

The botulinum toxins cancel nerve signals to the muscles, creating paralysis that can last for months. Given its extraordinary toxicity, doses are typically measured in trillionths of a gram, and targets are carefully chosen to silence only the desired motor nerves.

When Botox and related botulinum drugs entered the market, “the idea was that they are safe to use, they stay where they are injected, and you don’t have to worry about toxin going to the central nervous system and causing weird effects,” says Edwin Chapman, an investigator at the Howard Hughes Medical Institute and professor of neuroscience at the University of Wisconsin-Madison.

The concern that this powerful toxin can move beyond the injection site was reinforced in 2009, when the Food and Drug Administration added a prominent warning to prescribing information “to highlight that botulinum toxin may spread from the area of injection to produce symptoms consistent with botulism,” including “unexpected loss of strength or muscle weakness.”
… Understand that swallowing and breathing difficulties can be life-threatening and there have been reports of deaths related to the effects of spread of botulinum toxin.” Additionally, physicians have seen puzzling results from treatment, adds Ewa Bomba-Warczak, a doctoral candidate in neuroscience. “In many cases, after an injection for a disabling spasm of neck muscles called cervical dystonia, there is no change in muscle tone but the patient finds relief and is perfectly happy. That result can’t be explained by the local effects.”

In a study published today (Aug. 4, 2016) in Cell Reports, senior author Chapman, first author Bomba-Warczak and colleagues present clear evidence that toxin is moving between neurons in a lab dish. The study looked at mouse neurons in wells connected by tiny channels that allow growth of axons — the long fibers that neurons use to communicate. In tests of two botulinum toxins, the researchers saw toxin molecules entering the injected cell, as expected.

Once inside a neuron, botulinum toxin cleaves proteins responsible for fusion of chemical containers, known as vesicles, with the plasma membrane. This fusion event releases chemical signals that underlie communication with muscles, and the inability to fuse leads to the temporary paralysis caused by botulinum toxin.

Using antibodies to identify fragments of the damaged proteins, Chapman’s group showed that toxin molecules were moving to nerve cells in wells that had not initially received the harmful molecules. “Every time one fraction of the toxin acts locally (on the first nerve cell it contacts), another fraction acts at a distance,” says Chapman. “It’s unknown how far they travel, which likely depends on the dose of toxin and other factors.”

Co-author Jason Vevea, a UW-Madison postdoctoral fellow, produced videos showing tagged molecules of botulinum toxin moving along the axons connecting neurons. Botulinum toxins were first described in the 1800s, and have long been a subject of research at UW-Madison. Allergan PLC, which markets four versions of botulinum toxin, reported global Botox sales of nearly $2 billion in 2015. By finding that toxin molecules don’t always stay where they are injected, Chapman says the Wisconsin study answers a long-standing question about mobility, but raises several more. “We have seen that these toxins enter neurons at the injection site, causing the desired local paralysis, but Ewa and Jason have shown unambiguously the existence of a second entry pathway that takes some of the toxin molecules to other neurons.”

The research, done in a lab dish, removes variables that have plagued similar studies performed in animals, Chapman says. “We wanted to see if we could build an in vitro (in a dish) system that allows direct visualization of this putative movement, in a way that’s simple, easy to interpret, and unambiguous. Do they move, or do they not?” Chapman wonders about the effects of extraordinarily powerful toxin molecules that travel the neural networks. Local effects have, until now, been deemed the sole effects. But could part of its effects be due to the transported toxin?

These questions could be answered by genetically engineering the Clostridium bacteria that make botulinum toxin to alter the toxin’s structure, Chapman says. “We may be in a position to mutate the part of the toxin that attaches to a receptor on the neuron so it can only enter the local pathway, not this new pathway we have described.” If only the local effects matter for medicine, tomorrow’s versions of this ancient toxin molecule may be able to alleviate symptoms from wrinkles to severe muscle spasms without moving beyond the target neurons.

“I have a hard time imagining that any physician is going to want to inject something they know can move about when they have an option to use something that stays put,” Chapman says. “It’s an exciting prospect, supplanting a $2 billion drug with a safer drug.”

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Annual Picnic!

Students take home a win for the second year in a row for the annual students vs. faculty volleyball game!

Contributions to the Program

Funds given to the program are used to support recruiting activities, guest speakers, the graduate travel award for professional conferences and the annual program picnic. For additional information, please contact the program office at (608) 262-4932. To contribute, please contact the UW Foundation at:

https://www.myuwconnect.org/give?id=9E933A87-82C0-449E-B62E-6476CF0A0A93

Thank you to all those who have contributed and continue to support the Neuroscience Training Program and its students.