

BrainStorm

Fall 2016

Program in Neuroscience
University of Maryland School of Medicine
<http://lifesciences.umaryland.edu/neuroscience>

New Faculty Researcher: Seth Ament

By Alex Klausing, PIN student

INSIDE THIS ISSUE

- 1 New Faculty
Researcher: Seth Ament
- 2 NOVA
- 3 Faculty Research
Highlights
- 4 New Faculty
Researcher: Ivy Dick
- 5 Novel Methodology;
"Shedding Light" on the
Brain
- 6 Brain Science Research
Consortium
- 8 Student Highlights

Seth Ament is a recent addition to the Program in Neuroscience. He is an Assistant Professor in the Department of Psychiatry and a faculty member of the Institute for Genome Sciences at the University of Maryland, Baltimore.

Dr. Ament's research is looking at the role of genetics and epigenetics in adult-onset psychiatric disorders, such as bipolar disorder. He is currently using a systems biology approach to discover mechanisms linking genetic, epigenetic, transcriptional, and phenotypic changes in patients with psychiatric disorders.

Another way to discover potential genes of interest is by studying rare variants in families, where a family or a group of families have a history of a specific mental illness and this may be due to one or a few key mutation(s) in a gene or genes. Promising genes are then pursued in a neural stem cell model to see what downstream targets the genes impact and how different regulation of the genes can affect these targets.

From there, Dr. Ament hopes to eventually observe the impact of modulating these genes of interest in animal models and study the behavioral effects of these changes. Understanding the genetic causes and their downstream mechanisms can lead to improved treatment and diagnostics for patients suffering these devastating mental disorders.

Dr. Ament received his A.B. in Biology from Harvard University in 2003. He then received his Ph.D. in Neuroscience from the University of Illinois in 2010, where he studied molecular mechanisms of honey bee social behavior under the guidance from

New Faculty Researcher continued on page 7

NOVA

By Amanda Labuza, PIN student and President of NOVA

You get more than you give. It is a phrase I have always believed, and I find it to be true every time I volunteer. It is one of the reasons I jumped at the chance to help our student led volunteer group, NOVA, expand.

NOVA began just as I started grad school here five years ago. Students and faculty were taking monthly trips to play bingo with patients at the nearby Spring Grove Psychiatric Hospital, giving prizes to the winners of the bingo games. As demand for prizes grew, they started an official group named “Neuroscience Outreach and Volunteer Association” (NOVA). I am pleased to say that the same group now has students from across the university participating in 3 annual events, various science demonstrations throughout the year for the public, and members are still playing monthly bingo.

To help with prizes for the bingo games, we began an annual fundraiser. We collect donations of toiletries, books, and gently used clothing in exchange for delicious halal cart food (if you ever visit UMB you *have* to try it- *delicious!*). This past year our fundraiser filled an entire office, floor to ceiling with donations, so that we had to be moved to a bigger room. We were able to not only have prizes for the patients for the whole year, but also to have an entire car full of clothes and toiletries to give to a local women’s shelter. I was so proud of our students for their generosity and even prouder of NOVA for their hard work.

As I said, we do a lot more than just bingo. In a few weeks NOVA will bring local high school students to the UMB campus to do live demonstrations in the laboratories with them and discuss careers in science. For Brain Awareness Week in March we travel to multiple schools in the Baltimore area and teach classes for the day. We do a variety of hands on activities with many other local groups. I am elated to see how far NOVA has come since its start and where it will go next.

For more information check out our website at: umbconnect.umaryland.edu/organization/nova. Here you can find current events we have going on and pictures of past events



Fundraiser to collect bingo prizes



PIN researchers teach local students during Brain Awareness Week

Program in Neuroscience Faculty and Postdoctoral Fellow Research Highlights

Aihui Tang, Ph.D. and **Tom Blanpied, Ph.D.** along with former students **Haiwen Chen, Ph.D.** and **Tuo Peter Li, Ph.D.**, and current student **Sarah Metzbower** were all authors on a paper “A transsynaptic nanocolumn aligns neurotransmitter release to receptors” in the journal *Nature*.

Brian Mathur, Ph.D., received an R01 grant from the National Institute on Alcohol Abuse and Alcoholism entitled “Striatal Microcircuit Dynamics of Ethanol Habits” and is organizing this year’s Society for Claustrum Research Symposium to be held at the Salk Institute in La Jolla, CA.

Andrea Meredith, Ph.D., was appointed as a standing member of the NIH study section “Neurotransporters, Receptors, Channels and Calcium Signaling” and organized the 70th Annual Society of General Physiologists Symposium at the Marine Biological Laboratory in Woods Hole, MA, entitled, “Genetic and Animal Models for Ion Channel Function in Physiology and Disease.”

Panos Zanos, Ph.D., **Polymnia Georgiou, Ph.D.**, **Greg Elmer, Ph.D.**, **Edson Albuquerque, M.D., Ph.D.**, **Scott Thompson, Ph.D.**, and **Todd Gould, M.D.** are all authors on a paper published in the journal *Nature* entitled “NMDAR inhibition-independent antidepressant actions of ketamine metabolites.”

Leon Brown, Ph.D., former PIN student and postdoctoral fellow at the Maryland Psychiatric Research Center has been awarded a 2016 NARSAD Young Investigator Award.

Brian Polster, Ph.D., received an R21 grant from the National Institute of Neurological Disorders and Stroke entitled “Mitochondrial Structural and Functional Remodeling in Microglial Activation”.

Mary Kay Lobo, Ph.D., presented her research proposal at the 22nd International Mental Health Research Organization Music Festival for Brain Health in Napa Valley, CA.

Aihui Tang, Ph.D., has been awarded a 2016 NARSAD Young Investigator Award

Luana Colloca, M.D., Ph.D., was given both the Patrick D. Wall Young Investigator Award by the International Association for the Study of Pain and the Stephan Milan award for excellence in Temporomandibular Disorders research.



Andrea Meredith, Ph.D., with her graduate student, Josh Whitt, Ph.D. at his thesis defense.



The first Bradley Alger Neuroscience Lecture. Left to right: Dr. Michael Shipley, Director PIN; Dr. Bradley Alger, Professor Emeritus; Sarah Metzbower, PIN student; Dr. Scott Thompson, Chair and Professor.

The first Bradley Alger Neuroscience Lecture. Dr. Bradley Alger, Professor Emeritus and many current and former PIN students.



Ivy Dick, Ph.D.- PIN's New Faculty Members

“There is something very beautiful and exciting about watching a single channel opening and closing,” says Ivy Dick, a new Assistant Professor in the Department of Physiology. The first time she recorded from a single ion channel as a summer intern was the moment that she knew she was hooked on biophysics. Doing this internship in the lab of Dr. Charles Cohen, who was both her mentor and her neighbor, meant that the daily drive was both a commute to work and a lesson in biophysics.

Dr. Dick's science career began as an electrophysiologist at Merck. From there she did her graduate and postdoctoral research in the Calcium Signals Lab at Johns Hopkins University on voltage-gated calcium channels and the mechanisms that regulate them.

While at Hopkins, her mentor, Dr. David Yue, was incredibly influential in her scientific career. “His enthusiasm for science was infectious,” she says, “and from him I learned the joy of scientific discovery.” She plans to continue using what she learned from him in the design and execution of studies, eloquence in paper writing and in not discounting “the tremendous value of integrity and humility.”

Dr. Dick's current research expands on her previous work and looks specifically at the mutations in calcium channels that cause Timothy Syndrome, a disorder that affects many different body systems, including the heart where lethal arrhythmias can develop. Two different gene mutations cause Timothy Syndrome, and Dr. Dick's research has shown that there are different mechanisms associated with each mutation. The varying symptoms of Timothy Syndrome can be explained by these different mechanisms, and, as Dr. Dick describes, “the results of this study have led us to propose a new therapeutic strategy for the treatment of Timothy Syndrome.”

Future research will continue to seek out mechanisms of regulating voltage-gated calcium channels. Disruption of this regulation is known to lead to several disorders, including autism. Dr. Dick would like to better understand how these mechanisms function and focus on “how new therapeutic strategies can address these disruptions.”



The collaborative nature of environment of the Program in Neuroscience and the University of Maryland School of Medicine is a main reason that Dr. Dick decided to join forces here. She looks forward to working with many of the researchers here in this environment which she sees as “conducive to success”.

If looking for Dr. Dick outside of the laboratory, you may have to search far and wide because she loves to hike, especially in remote places. The Program in Neuroscience welcomes Ivy Dick as one of its newest members.

PIN Faculty Pioneer a Novel Methodology to “Shed Light” on the Brain

By Jennifer McFarland, PIN student

Recently, Drs. Mark Rizzo, Tom Blanpied, and Andrea Meredith have been collectively awarded a grant funded by **Obama’s BRAIN (Brain Research through Advancing Innovative Neurotechnologies) Initiative**. This initiative is “a bold new research effort to revolutionize our understanding of the human mind” by “supporting the development and application of innovative technologies that can create a dynamic understanding of brain function.” (<https://www.whitehouse.gov/share/brain-initiative>)

Dr. Rizzo, Blanpied, and Meredith aim to adapt an already novel imaging technology called dual-inverted Selective Plane Illumination Microscopy (diSPIM), developed in the lab of Dr. Hari Shroff, to simultaneously image up to three fluorescent biosensors in a living brain slice.

To reflect on the uniqueness of this aim, Dr. Rizzo’s lab is currently pioneering the task of implementing three biosensors in a single system, and, to date, only a single brain slice has been imaged, albeit with moderate success, using this type of microscope. Therefore, ***executing this logistically challenging adaption of diSPIM will afford these labs the unique ability to dynamically and quantitatively measure three different parameters simultaneously in each individual cell of an entire neuronal circuit.***

If you’re familiar with microscopy, you may be wondering why we need such a fancy microscope to measure the light intensity emitted from fluorescent biosensors expressed in a brain slice, rather than just using well-established tools such as confocal or two-photon microscopy. One reason is that the diSPIM technology itself is, for highly complex reasons that I won’t explore here, particularly well-suited for imaging the type of biosensors developed in Mark’s lab called FLouescence Anisotropy REporters (FLAREs).



FLAREs are single-color, rather than the typical dual-color, Forester Resonance Energy Transfer (FRET)-based biosensors, which is what allows for the measurement of the output of not just one, but three different biosensors in a single system.

The second reason for using diSPIM to image our biosensors is that it allows us to address scientific

Selective Plane Illumination Microscopy (iSPIM/diSPIM) from ASI

Novel Methodology to “Shed Light” on the Brain continued from page 5

questions that require particularly high spatial or temporal resolution. Therefore, this powerful technology can be used to study the molecular mechanisms underlying the circadian rhythmicity of the suprachiasmatic nucleus (Dr. Meredith’s work); this requires multiple days of imaging and would be rendered impossible by the high amount of photobleaching that would result from confocal imaging. diSPIM can also be implemented to gain access to the molecular workings of long-term potentiation in the hippocampus (Dr. Blanpied’s work); this requires a degree of subcellular resolution not afforded by two-photon microscopy.

In summary, this endowment will lead to the development of a cutting edge technology, expanding the scope of scientific questions investigators may ask.



Brain Science Research Consortium Unit (BSRCU).

Brain Science Research Consortium Unit

Established in 2014, the overarching goal of the **Brain Science Research Consortium Unit (BSRCU)** is to increase the pace and scope of translational research across the School of Medicine. Led by an Executive Committee comprised of nine Department Chairs and Program Directors to collaboratively guide the Consortium, the BSRCU is further segmented into specific working groups, including: 1) Focused Ultrasound; 2) Neuroinflammation; and 3) Neuropsychiatric and Substance Abuse Disorders.

The Executive Membership meets regularly to guide the development of this initiative. Additionally, the BSRCU hosts or co-hosts open seminars (including our regular monthly BSRCU Seminar Series) and mini-symposia, all with the fundamental goal of fomenting cross-disciplinary dialogue that catalyzes new, translational research.

Membership of the BSRCU is open to all interested UMB scientists, clinicians, and physician-scientists. By way of the BSRCU, networking reach is exponentially increased, and the start of a mere conversation has led to unifying, large-scale research among members.

For more information and to join the BSRCU, please visit our website at <http://medschool.umaryland.edu/BSRCU/> or email BSRCUinfo@psych.umaryland.edu.

New Faculty Researcher continued from page 1

his advisor, Gene Robinson. For his postdoctoral work, Dr. Ament worked at the Institute for Systems Biology in Seattle, Washington. At the institute, he worked under the guidance of Leroy Hood and Nathan Price, where he began to develop much of the research strategy and ideas for his new lab.

In September of 2016, Dr. Ament joined the University of Maryland, Baltimore to start his own lab. He came to the University of Maryland, Baltimore because he believes that the university has a strong community of scientists who are constantly looking to collaborate. He also thinks his research goals fits well here since the university has strong core centers of neuroscience and genomics, and he looks to strengthen the bridge between the two.

The 19th Annual PIN Retreat Lab Olympics

Every year the entire PIN community spends a day at an off campus site listening to talks and engaging with other members of the community. This year's retreat included a Lab Olympics where participants were asked to do everything from calculating molarity to filling a box of pipette tips to putting on all the elements of safety gear as quickly as possible.





Some of the current PIN students at the beginning of the year Welcome Potluck

Program in Neuroscience Student Highlights

Mary Patton, a PIN student, is the recipient of a National Institute of Alcohol Abuse and Alcoholism NRSA training grant entitled "Mechanism of protection against ethanol sculpting of a striatal microcircuit".

Amanda Labuza, a PIN student, was chosen to be funded by the School of Medicine's T-32 Muscle NIH Training Grant, and **Jennifer McFarland**, a PIN student, was chosen to be funded by the School of Medicine's T-32 Membrane NIH Training Grant.

Program in Neuroscience University of Maryland School of Medicine

655 W. Baltimore St.
HSF1 Room 212
Baltimore, MD 21201

Phone:
(410) 706-4701

E-mail:
Renee Cockerham, Program Manager:
rcockerham@som.umaryland.edu



Josh Whitt, a former PIN student, published a paper entitled "BK channel inactivation gates daytime excitability in the circadian clock" in the journal *Nature Communications*.

Sai Sachin Divakaruni, an MD/PhD student, has been awarded both an NIH NRSA training grant and the Nataro Family Foundation Scholarship for the Medical Scientist Training Program.

Michael White, a PIN student, has published a paper entitled "Cortical hierarchy governs rat claustracortical circuit organization" in the *Journal of Comparative Neurology*.

Nisha Pulimood, a PIN student is an author on the paper "Astrocytes Assemble Thalamocortical Synapses by Bridging NRX1 α and NL1 via Hevin" in the journal *Cell*.

Kasey Girven, a PIN student, gave a talk entitled "A role for the insular cortex and extended amygdala in the modulation of behaviors" in the Baltimore Brain Series.

Artwork provided by Stephan Vignes Ph.D.,
Research Associate