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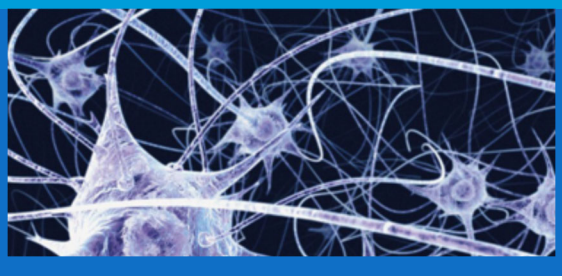
NEURONETWORKS



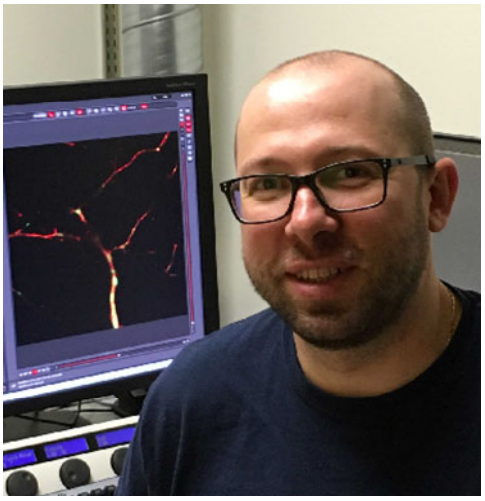
NEWSLETTER FOR THE WVU NEUROSCIENCE GRADUATE PROGRAM

Randy Nelson, Ph.D.
Program Director

Bernard Schreurs, Ph.D.
Associate Program Director

Cassandra George
Program Coordinator

Morgantown, WV



FEATURED FACULTY

Martin Hruska, Ph.D.

Dr. Martin Hruska joined the faculty at WVU in February 2021. He received his Ph.D. in Anatomy and Neurobiology from the University of Vermont, where is studied the mechanisms of programmed cell death using chicken ciliary ganglion as a model system. He then went on to do postdoctoral research at the University of Pennsylvania and Thomas Jefferson University in Philadelphia. His postdoctoral work focused on understanding molecular mechanisms that regulate the formation of excitatory synapses in the brain that provide substrates on which to build neuronal circuits for human cognition and behavior. Indeed, when these processes go awry, it leads to diseases like autism, schizophrenia, and depression. His lab will continue to investigate molecular mechanisms of synapse formation, function, and plasticity while extending this work to determine how synaptopathies might underlie neurological disorders.

One current focus in his lab is to understand how specific patterns of connectivity emerge during brain development. The hypothesis they are testing is whether different combinations of molecules known to play a role in synapse formation might inform neurons with whom to connect with high specificity. Thus, they are in search of a molecular code for neuronal wiring. Cracking this code will provide vital information for understanding how miswiring could lead to defects in behavior and cognitive impairments associated with neurodevelopmental disorders such as autism and schizophrenia.

Another aspect of their work looks at how neurological diseases like AD and stroke impact synaptic signaling and plasticity. They think that defective synaptic biology in these disorders results from alterations in the molecular organization of synaptic components at the nanometer scale. These nanometer synaptic changes likely precede the loss of synapses and neuronal degeneration. Thus, understanding how synaptic nano-architecture is impacted early on in these disorders could enable the development of new therapies that target specific synaptic pathways, which might be effective in reversing the course of these diseases.

To address these questions, they undertake multiple approaches. They use Stimulated Emission Depletion super-resolution microscopy. This approach is critical to the understanding of synaptic function since synapses are tiny sub-micron biological compartments. Compared to conventional light microscopy, STED nanoscopy improves XY resolution ~ 4-6 fold enabling us

to visualize structures in the brain down to 30-40 nm. To study signaling events at synapses, they manipulate synaptic proteins expression using the overexpression of mutant constructs, RNAi, and CRISPR. By combining microscopy, molecular biology, and biochemistry, they hope to shed light on how the complex biology of synapses underlies normal brain function and how these processes are dysregulated in the disease of the nervous system.

FEATURED STUDENT

Jacob Boos

Jacob is currently in his 5th year of his PhD studies in the lab of Dr. Werner Geldenhuys. Prior to attending WVU, Jacob graduated from St. Edward's University in Austin, Texas, with a B.S. in Biology. His dissertation research has focused on using genetic and pharmacological approaches to understand the role of the mitochondrial protein mitoNEET in age-related oxidative stress and neurodegenerative disorders.

Oxidative stress is the result of an imbalance between reactive oxygen species production and the body's antioxidant defense mechanisms. Chronic oxidative stress has been shown to contribute towards the progression of neurodegeneration observed post-stroke and in Alzheimer's, Parkinson's, and Huntington's diseases. Previous studies have shown that mitoNEET is a mediator of oxidative stress, with knockout models showing increased levels of oxidative stress. However, a mitoNEET overexpression model of aging has not been extensively evaluated. In their lab they use transgenic Caenorhabditis elegans knockout and overexpression models of aging to understand how both the loss and overexpression of mitoNEET may protect and increase resistance against age-related oxidative stress. Furthermore, thiazolidinedione (TZD) class drugs, such as the diabetes drug pioglitazone, have been shown to be mitoNEET agonists and protect against the effects of oxidative stress. Their lab screens novel TZD-class mitoNEET agonists in their transgenic models of aging, with preliminary studies showing treatment with these novel compounds increase protection and resistance to age-related oxidative stress. With this information, they hope to shed light on mitoNEET's potential as a target for the development of new treatments to combat neurodegenerative diseases—such as Alzheimer's, Parkinson's, and Huntington's diseases—where oxidative stress is known to be a contributing factor of disease progression.

Jacob has a wide variety of hobbies outside of the lab. You can see him at the rec fields playing ultimate frisbee, beach volleyball, at the bocce ball courts at his apartment, or keeping up with a hobby he's had since he was a child—visiting local sneaker boutiques in search for sneakers to add to his collection. Following the completion of his Ph.D. studies, Jacob intends to pursue a career in drug R&D, working with groups that develop new treatments to combat and hopefully one day reverse the effects Alzheimer's disease.

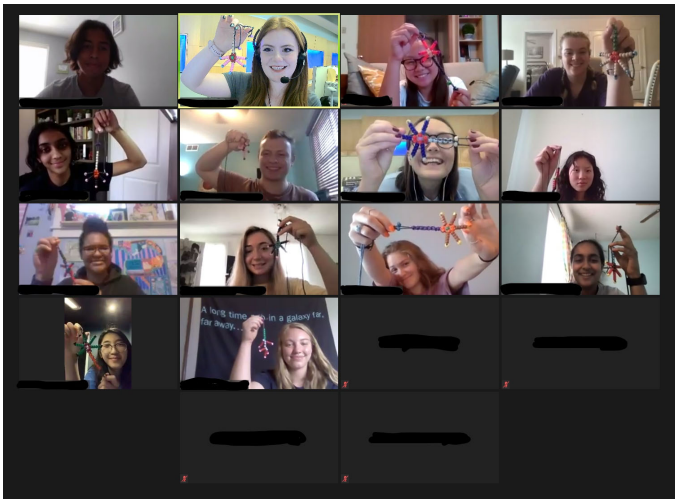
FEATURED STUDENT

Robin Oliverio

Robin completed her undergraduate degree at West Virginia University, where she worked with Dr. Gary Marsat, studying communication in a species of weakly electric fish called Apteronotus albifrons. She is currently a third year PhD student in Dr. Zach Weil's lab, where she study the relationship between traumatic brain injury (TBI) and alcohol misuse. Her lab previously found that female mice who experienced a TBI early in life drank significantly more than uninjured females. Interestingly, when they introduced a rehabilitative measure known as environmental enrichment, where the mice are housed in larger cages with toys and extra bedding, they found that this attenuated the alcohol consumption in injured female mice. Her research focuses on analyzing a potential mechanism by which environmental enrichment modulates the response to alcohol in females that experienced a juvenile TBI.

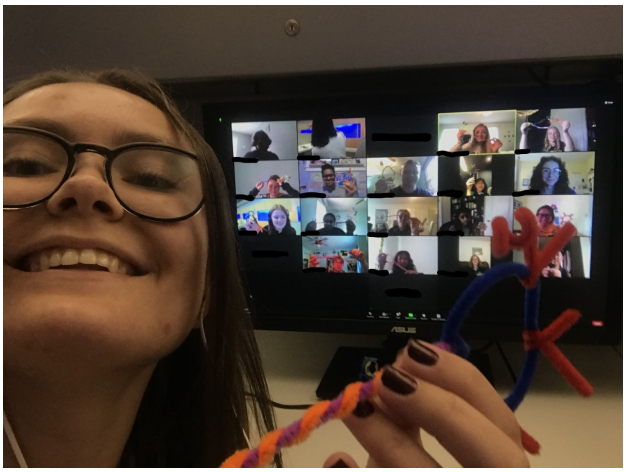
NEUROSCIENCE DEPARTMENT OUTREACH

Brain Camp 2021



The Department of Neuroscience hosted Brain Camp 2021 virtually, after having to cancel the program in 2020 due to Covid-19. Despite looking a little different in a virtual format, everyone was excited to have students back interacting with faculty and trainees while growing their love of neuroscience! Eleven students from West Virginia, Virginia, Ohio, Pennsylvania, and Michigan participated in the weeklong Brain Camp from July 18-23. Neuroscience graduate and undergraduate students served as counselors throughout the week, supporting students with activities and the newly added research proposal project. The counselors did a great job keeping things fun and positive! One student said, "I really enjoyed the friendly atmosphere that the counselors and staff created, it made me feel a lot more comfortable."

Several faculty members Zoomed in to showcase their research and highlight the variety of topics in the world of Neuroscience. Dr. Kate Weil started the week by introducing the students to neuroanatomy, sharing a live demonstration with samples from the gross anatomy lab. Drs. Victor Finomore and Scott Galster presented on the innovative research happening across the Rockefeller Neuroscience Institute; Michael Morehead, creator of syGlass, stopped by for a virtual demonstration of his 3-D imaging virtual reality software; and Ashley Douglas, a graduate student in Dr. Melissa Blank's lab in Psychology, shared her research on tobacco, just to name a few. Students also learned about addiction, Alzheimer's disease, rodent behavior models, circadian rhythms, neurosurgery, concussions and traumatic brain injuries, and stroke. One student told us, "My favorite part of Brain Camp was being able to speak with presenters and professors about topics they are curious in, and they study every day. This is an experience that I have not had before, and I will carry the memories I made during these discussions and lectures."



A new additional to the program this year was a small group research proposal project in which students worked together to develop a research proposal on a topic of interest to present at the end of the week. One student thought the project "was fun and informative (and) gave good exposure into research projects that we might have to do in college." Research topics proposed by the students included investigating the symptoms and potential treatments of schizophrenia, researching the connection between stress during childhood and hippocampal volume, and the effects of brain trauma on motor and cognitive functioning. Another student said, "I had so much fun with the research proposal project, and I really enjoyed the one-on-one feedback that my counselors gave my group and me."

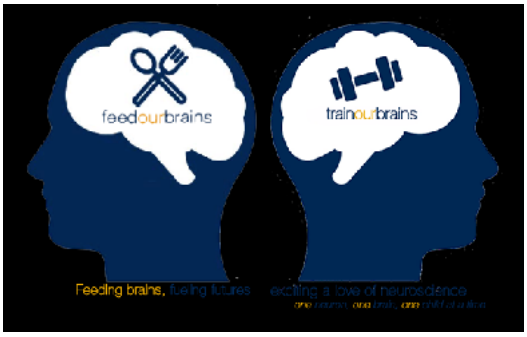
While the evening activities students typically have the opportunity to participate in while visiting Morgantown were unavailable due to the virtual format, counselors were able to include fun social activities during the day. Students competed in a Brain Bowl to test their neuroscience knowledge; got crafty by making pipe cleaner neurons, clay brains, and neuron keychains; and even used their engineering skills to simulate the importance of protecting the brain through an egg drop challenge. Students were also able to participate in a livestreamed tour of the downtown campus presented by the WVU Visitor's Center. After camp, one parent told us, "We plan to visit WVU and especially the neuroscience department ASAP." Two students shared with us that "If I'm attending WVU next fall, I would definitely want to come back potentially as a leader" and that "I have really enjoyed meeting everyone and I hope to have time to come back during undergrad and help with the camp."

Parents were extremely happy with the outcome of Brain Camp this summer, despite not being able to visit campus in-person. Once parent shared, "My son is a very shy person who doesn't like to speak in a group and in this week, I saw him speaking and excited to talk about his "experiments" in the camp. I think that the organizers did a good job in keeping the engagement despite of the camp being online." One focus of Brain Camp is to engage our students and encourage them to think about things in a more scientific way while fostering a love of learning. Once parent could attest to this, saying, "My daughter said this is the most interested she's been in learning since COVID. I feel the leaders were better prepared and engaging than her instructors during the school year." Another parent explained their child's newfound interest in neuroscience. "My daughter loved all the lecturers and counselors who were really fun, engaging, and easy to talk to. She was very excited every day and could not wait to tell me what she learned that day. This experience really changed her to be interested in neuroscience. She wants to invent a neuromodulator for her autoimmune skin condition, and she just started reading primary journal articles which she never has done before. She learned how she can apply a technology from one field to another. Really opened her mind. I cannot thank you enough. You guys did a great job cultivating young high schoolers!"

Brain Camp will be returning in-person from July 17th - 23rd, 2022!

FEED OUR BRAINS

The Neuroscience Department has held two Dine and Donate events supporting Feed Our Brains with Tera Cafe and Buffalo Wild Wings. The Neuroscience Club had information/activity booths at both events. The Neuroscience Department also donated $2,000 to Mountainview Elementary to help pay down their school lunch debt.



NEUROSCIENCE GRADUATE STUDENT ORGANIZATION (NGSO)

The Neuroscience Graduate Student Organization (NGSO), is dedicated to serving the Neuroscience students, providing opportunities to develop their science communication and teaching skills, as well as opportunities to serve their community through outreach. In the past, the Neuroscience program's students and faculty have served as judges in elementary and high school science fairs, hosted booths and info stations at schools, public libraries and restaurants, to educate our community about the wonders of our brain!

Following the unprecedented global pandemic over the past 1.5 years, and the associated halt to all extracurricular activities NGSO is excited to be back, hopefully, in (socially-distanced!) person. Our first goal for this year is to reinstate outreach and social events. We aim to provide activities for students to relax, have fun, and share their science. Some of the events planned include a mindfulness seminar, trivia night, axe-throwing, host booths with educational content at schools and our Feed Our Brains events, and much more! Additionally, we are planning a very special week for the annual Graduate Student Appreciation Week in April.

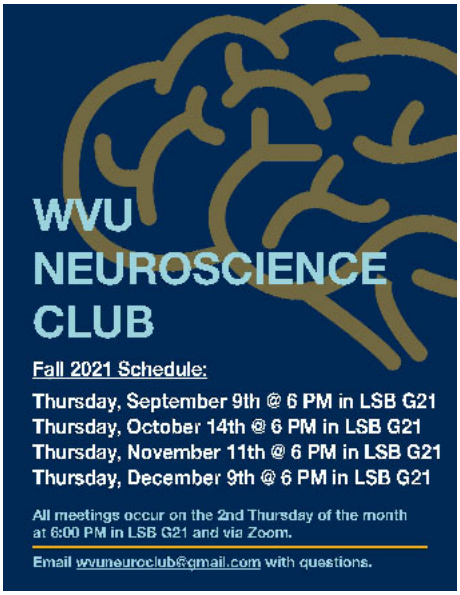
Our second goal for this year is to strengthen peer-to-peer support, as well as NGSO's role as mentors to the undergraduate Neuroscience Club students. Last year, Ms. Morgan Prunty, our organization's advisor, developed a successful graduate-undergraduate student mentorship program to advise and support students. This year, we are expanding this program into a triad consisting of a senior and a junior graduate student along with an undergraduate student, aiming to provide support early on in the graduate student's career, training them on how to mentor students, and providing the undergraduate student with the perspective of graduate students at different stages. Further, graduate students will facilitate access to research and development opportunities, and provide guidance regarding higher education, to their undergraduate mentees. We are excited to see this program help us build community!

Although the NGSO is primarily composed of students in the doctoral neuroscience program, it is *not* exclusive to these students. All are welcome! If you are interested in any of the above, please email NGSO at wvu.ngso@gmail.com to be added to their listserv.

Meet the officers

This year's officers are Hecmarie Meléndez-Fernández, President, Robin Oliverio, Vice-President, Tyler McGaughey, Treasurer, and Anna Korol, Secretary, all part of the doctoral program in Neuroscience. Hecmarie is a third-year student in Dr. Randy Nelson's lab. Her work focuses on how disrupted circadian rhythms influence cardiovascular health outcomes. Robin is also a third-year student in Dr. Zachary Weil's Lab. She studies traumatic brain injury and its relationship to alcohol misuse. Tyler is a fourth-year student in Dr. Victor Finomore's lab and focuses on the use of functional magnetic resonance imaging for a number of translational biomedical applications. His dissertation research focuses on neural changes associated with chronic pain. Anna is a second-year student working in Dr. Val Gritsenko's lab, and she aims to develop passive and active assistive technology for rapid movement recovery after stroke. Together, they plan on revitalizing NGSO by listening to their students, enabling social and professional development opportunities, and instilling neuroscience awareness in their community through outreach and service. Please join them in this endeavor!

WVU NEUROSCIENCE CLUB



With school officially back in session, the WVU Neuro Club is excited to introduce our new officers, welcome new members, and have an overall great semester. For the 2021-22 academic year, our club president is Maggie Robertson, a junior Biology major from Parkersburg, West Virginia. Fulfilling the role of vice president, Samantha Higley is a junior Neuroscience major from Dublin, Ohio. Serving her second term as treasurer, Sarah Lester is a junior Exercise Physiology major who hails from McDowell County, West Virginia. Alexandra Benyola, our newly elected outreach chair, is a sophomore Neuroscience major from Williamstown, NJ, and Yssabela Cabuyao, a sophomore Neuroscience major from Morgantown, WV, is this year's secretary.

For this academic year, our officers are excited to announce new plans and events while simultaneously expanding our pre-existing efforts. For outreach, the club hopes to establish a neuroscience education program within local high schools to encourage and excite students about the discipline. Similarly, our club plans to continue our undergraduate-graduate mentorship program to aid those of our members who are pursuing graduate school. On a similar note, our club is delighted to continue our association with the Neuroscience Graduate Student Organization, and we can't wait to see what joint events this year will bring. Lastly, our club is eager to introduce the new position of social media coordinator at our first meeting, and our first meeting will be on September 9th from 6-7 pm in the Life Sciences Building.

NEUROSCIENCE STUDENT ACCOMPLISHMENTS 2020-2021

Jacob Boos

Boos, J.R., Shubbar, A. & Geldenhuys, W.J. Dual monoamine oxidase B and acetylcholine esterase inhibitors for treating movement and cognition deficits in a C. elegans model of Parkinson's disease. Med Chem Res 30, 1166–1174 (2021). https://doi.org/10.1007/s00044-021-02720-x

Jacob Bumgarner

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Walker II WH, Bumgarner JR, Nelson RJ, DeVries AC. (2020). Transcardial Perfusion is not Required to Accurately Measure Cytokines within the Brain. Journal of Neuroscience Methods 108601.

Walton JC, Walker II WH, Bumgarner JR, Melendez-Fernandez OH, Liu JA, Nelson RJ. 2020. Circadian Variation in Efficacy of Medications. Clin Pharmacol Ther. https://doi.org/10.1002/cpt.2073
Weil ZM, Fonken LK, Walker II WH, Bumgarner JR, Liu JA, Melendez-Fernandez OH, Zhang N, DeVries AC, Nelson RJ. 2020. Dim Light at Night Exacerbates Stroke Outcome. Eur J Neurosci. 52: 4139

Bumgarner JR, Nelson RJ. 2021. Light At Night and Disrupted Circadian Rhythms Alter Physiology and Behavior. Integr Comp Biol icab017.

Bumgarner JR, Walker II WH, Liu JA, Walton JC, Nelson RJ. 2020. Dim Light at Night Exposure Induces Cold Hyperalgesia and Mechanical Allodynia in Male Mice. Neuroscience 343, 111-119.

Jacob Feldmann

John Nowery, Rylee Cisney, Jacob Feldmann, Gordon Meares. Nitric oxide induces a Janus Kinase 1 dependent inflammatory response in primary murine astrocytes. ASN Neuro. DOI 10.1177/17590914211033650

Anna Korol

Korol, A. S., Thomas, A. B., and Gritsenko, V. (2021) Muscle co-activation patterns to compensate for gravity load on the non-dominant arm are preserved across reaching directions. In preparation.

Jennifer Liu

Liu JA, Walton JC, DeVries AC, Nelson RJ (2021). Disruptions to Circadian Rhythms and Thrombolytic Therapy during Ischemic Stroke Intervention. Front. Neurosci.

Walker WH 2nd, Bumgarner JR, Walton JC, Liu JA, Melendez-Fernandez OH, Nelson RJ, DeVries AC. 2021. Light pollution and cancer. International Journal of Molecular Sciences. (in press).

Walton JC, Walker WH 2nd, Bumgarner JR, Melendez-Fernandez OH, Liu JA, Hughes HL, Kaper AL, Nelson RJ. 2020. Circadian Variation in Efficacy of Medications. Clinical Pharmacology and Therapeutic. (In press). doi: 10.1002/cpt.2073

Weil ZM, Fonken LK, Walker WH 2nd, Bumgarner JR, Liu JA, Melendez-Fernandez OH, Zhang N, DeVries AC, Nelson RJ. 2020. Dim light at night exacerbates stroke outcome. European Journal of Neuroscience, 52(9):4139-4146. doi: 10.1111.ejn.14915

Bumgarner JR, Walker WH 2nd, Liu JA, Walton JC, Nelson RJ. 2020. Dim Light at Night Exposure Induces cold Hyperalgesia and Mechanical Allodynia in Male Mice. Neuroscience. 434:111-119. doi: 10.1016/j.neuroscience.2020.03.022.

Tyler McGaughey

Fischer, K. M., Scott, T., Browe D., McGaughey T. A., Woods, C., Wolyniak, M. J., & Freeman J. W. (2020). Hydrogels for Skeletal Muscle Regeneration. Regenerative Engineering and Translation Medicine

Hecmarie Melendez-Fernandez

Walker W.H. II , Sprowls S.A., Bumgarner, J.R., Liu, J.A., Meléndez-Fernández, O.H., Walton J.C., Lockman, P.R., DeVries, A.C., Nelson, R.J. (2021) Circadian influences on chemotherapy efficacy in a mouse model of brain metastases of breast cancer. (Submitted to Frontiers in Neuroscience)

Walker W.H. II , Bumgarner, J.R., Walton JC, Liu, J.A., Meléndez-Fernández, OH, Nelson, RJ, DeVries, AC. Light pollution and cancer. Int. J. Mol. Sci. 2020, 21(24), 9360; doi:10.3390/ijms21249360

Walton J.C., Walker W.H. 2nd, Bumgarner J.R., Meléndez-Fernández O.H., Liu J.A., Hughes H.L., Kaper A.L., Nelson R.J. Circadian variation in efficacy of medications. Clin Pharmacol Ther. 2020 Oct 6. doi: 10.1002/cpt.2073. Epub ahead of print. PMID: 33025623.

Walker WH 2nd, Meléndez-Fernández OH, Pascoe JL, Zhang N, DeVries AC. Social enrichment attenuates chemotherapy induced pro-inflammatory cytokine production and affective behavior via oxytocin signaling. Brain, Behavior, and Immunity. 2020 Jul. DOI: 10.1016/j.bbi.2020.07.032.

Weil, Z. M., Fonken, L. K., Walker, W. H., Bumgarner, J. R., Liu, J. A., Melendez-Fernandez, O. H., ... & Nelson, R. J. (2020). Dim light at night exacerbates stroke outcome. European Journal of Neuroscience.

Robin Oliverio

Weil, Z. M., Karelina, K., Whitehead, B., Velazquez-Cruz, R., Oliverio, R., Pinti, M., ... & DeVries, A. C. (2021). Mild traumatic brain injury increases vulnerability to cerebral ischemia in mice. Experimental Neurology, 342, 113765.

Karelina, K., Schneiderman, K., Shah, S., Fitzgerald, J., Cruz, R.V., Oliverio, R., Whitehead, B., Yang, J. and Weil, Z.M., (2021). Moderate Intensity Treadmill Exercise Increases Survival of Newborn Hippocampal Neurons and Improves Neurobehavioral Outcomes after Traumatic Brain Injury. Journal of Neurotrauma.

Oliverio, R., Karelina, K., & Weil, Z. M. (2020). Sex, drugs, and TBI: the role of sex in substance abuse related to traumatic brain injuries. Frontiers in neurology, 11.

James Scripter

Cunningham JG, Scripter JD, Nti SA, Tucker ES (2021) Early construction of the thalamocortical axon pathway requires JNK signaling within the ventral forebrain. bioRxiv. doi: https://doi.org/10.1101/2021.04.09.439208

Bailey Whitehead

K. Karelina, K. Schneiderman, S. Shah, J. Fitzgerald, R. Velazquez Cruz, R. Oliverio, B. Whitehead, J. Yang, Z. M. Weil., "Moderate intensity treadmill exercise increases survival of newborn hippocampal neurons and improves neurobehavioral outcomes following traumatic brain injury." (Journal of Neurotrauma)

NEXT STEPS FOR OUR ALUMNI

Divine Nwafor, Ph.D.

M.D. in progress

Deidre O'Dell, Ph.D.

Research Assistant III at West Virginia University and Adjunct Instructor at California University of Pennsylvania in in California, PA

Ariel Thomas, Ph.D.

M.D. in progress

Jessica Cunningham, Ph.D.

M.D. in progress

Russell Hardesty, Ph.D.

Post-doctoral fellow at Albany Stratton VA Medical Center in Albany, NY

Dakota Jackson, Ph.D.

Post-doctoral fellow at the University of South Florida in Tampa, Florida

Dominic Quintana, Ph.D.

Post-doctoral fellow at Arcturus Therapeutics, Inc in San Diego, CA

P.I.C.K. WVU NEUROSCIENCE

Purpose
Innovation
Collaboration
Knowledge

WVU Rockefeller Neuroscience Institute