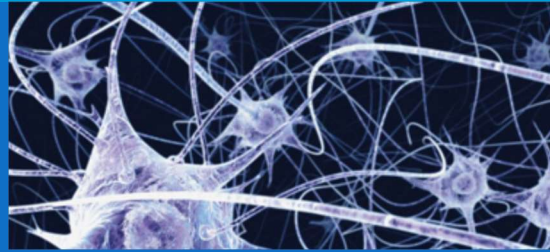


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NEURONETWORKS



NEWSLETTER FOR THE WVU NEUROSCIENCE GRADUATE PROGRAM

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FEATURED FACULTY *Charles Anderson, Ph.D.*



Dr. Anderson joined the faculty at WVU in the summer of 2017. He received a PhD in Neuroscience from Northwestern University and then conducted postdoctoral research at the University of Pittsburgh. His research is centered on understanding how we hear, with a focus on mechanisms that allow neurons in the brain to represent the recent history of the acoustic environment. This ability is crucial for normal auditory perception including the detection of novel sounds in a complex acoustic scene, the processing of the emotional content of speech, and for maintaining sensitivity to sounds across a range of different auditory environments. Since major neurological conditions such as autism and schizophrenia are associated with deficits in these abilities, this research aims to uncover fundamental mechanisms that support normal brain function.

His group uses a variety of approaches to address these important questions. He uses 2-photon calcium imaging in awake mice to measure how different sounds are represented by individual neurons. He uses optogenetic approaches, transgenic mouse lines for a light-based control of specific subsets of neurons, and whole-cell patch clamp recordings in acute brain slices to measure cell-type specific synaptic processing. And he uses behavioral testing in mice to assess the ability of normal mice and neurological disorder-related mouse models to process complex features of the auditory environment. Together, these experiments will provide a new framework for evaluating auditory processing, and will advance understanding of the of synaptic- and circuit-level mechanisms that support normal sensory processing and brain function.

Q&A:

What made you interested in science broadly and neuroscience specifically?

When I was a high school junior, I took a microbiology class where we used binocular, high-magnification microscopes to catalog different algae species from the classroom algae tank. It was amazing to see the complexity of these tiny creatures and instilled in me the belief that we can understand a great deal about the world through careful observation. In college I became interested in neuroscience when I took a course in which we learned that brain lesions in specific areas can lead to highly specific deficits in brain function. That got me started on the

What did you learn in graduate school that helped you most as a new faculty member?

In grad school, I was encouraged to tackle problems on my own as much as I could, without spinning my wheels too much. The training to push myself to solve problems as they arise served me well as I set up my own lab. That, and learning to code in MATLAB. MATLAB (which I started using as a first-year grad student) has allowed me to do experiments and analyses that would have been essentially impossible otherwise.

What is one piece of your work of which you are most proud?

I'm particularly proud of my first paper as a postdoc where we definitively settled a controversy in zinc neurobiology that had hindered the progress of the field since the early 2000s. We used new tools, new experiments, and a lot of controls to show that free zinc ions act as a synaptic signaling system for neurons in many regions of the brain. I draw a direct line from this paper to the research that we perform in my lab at WVU.

What, if any, are the biggest changes you have noticed in academia since you were a graduate student?

I got into the game in 2004, and I think a positive change has been the gradually increasing expectations of data transparency and statistical rigor in published papers. I also think the growth of pre-print servers (such as bioArxiv) is a major shift in how researchers share their findings with the world.

Do you think there is an optimal size for your lab group, or optimal postdoc: grad student ratio?

My PhD mentor only had one other grad student when I joined (and didn't yet have tenure), which is close to the model that I have in my lab at WVU. That was a nice environment because we were all hungry for productivity as a team. My postdoc lab had six or seven people, about half postdocs and half grad students at various times. It was also a nice size, but with a larger team it was harder for me to really know what everyone was working on. I think my optimal lab group is one where I can touch base with everyone daily and keep all their projects in my mind at once. I like a hands-on approach because I want to be able to give good advice and mentorship to my trainees.

FEATURED STUDENT***Divine Nwafor***

Divine is currently in his 3rd year of his PhD studies in the lab of Dr. Candice Brown and is an overall 5th year MD/PhD student. Prior to his MD/PhD studies, Divine graduated from West Virginia University with a B.S. in Biochemistry with honors. His dissertation work is focused on delineating the novel role played by tissue-nonspecific alkaline phosphatase (TNAP) in brain microvascular capillary endothelial cells in normal physiology and in sepsis.

Sepsis is a systemic life threatening condition often resulting from an infection. It is a leading cause of death globally and is concomitant with other co-morbidities such as stroke, cancer,

Alzheimer's disease, etc. Furthermore, 70% of patients who survive sepsis are burdened with neurological impairment. Although the clinical progression of sepsis is well understood, the mechanisms through sepsis promotes blood-brain barrier (BBB) dysfunction remain unclear. A functional understanding of the mechanisms that preserve BBB integrity may help alleviate acute sepsis associated encephalopathy and the long term neurological impairment seen in many survivors. My earlier work found that the activity of a novel enzyme (TNAP) localized to the BBB is decreased in the brains of septic and stroke mice. Further interrogation using in vitro barrier assays revealed *that* the inhibition of this TNAP in hCMEC/D3 and primary murine

capillary endothelial cells revealed a loss of barrier function. Currently, we have employed a genetic mouse model with a conditional loss of TNAP on endothelial cells to study BBB integrity and outline downstream pathways through which TNAP is able to exert its protective on the BBB.

Outside of lab, Divine loves to play soccer and is involved with numerous organizations and groups such as the Neurosurgery Interest Group, Surgery Interest Group, African Student Association, Neuroscience outreach group, etc. Following the completion of his MD/PhD studies, Divine intends to pursue a clinical career in Neurosurgery and a research career in understanding role and permutations of the microvasculature in neurological diseases.

Q&A:

Tell us about your path to the MD/PhD program?

My path to the MD/PhD program was non-traditional. Initially, I applied to WVU School of Medicine with the sole purpose of obtaining a doctorate degree in medicine. I had a keen sense that I always wanted to become a medical doctor at the age of 9; however, it was not until my first year of medical school that I began to truly evaluate a career as physician scientist. My participation in the first year medical school INTRO research summer program solidified my interests in the MD/PhD program. Following participating in the summer research program, I decided to apply for a lateral transfer from the MD program into the dual degree MD/PhD program. I am truly glad I did because my experience as a dual degree student at WVU has been remarkable.

If you are sitting on a plane with a stranger and a conversation starts up, how do you describe what you do?

My strategy to describe what I do is highly dependent on the audience; however, I have found that keeping things simple works best irrespective of the audience. I typically follow a known to unknown strategy when describing what I do. For instance, everyone is familiar with the term infection, however, people may not understand what sepsis is. Therefore, when describing my work to others I tell them I study infections in the blood (i.e. sepsis) and how these infections affect normal brain function. Thereafter, I proceed to telling them the objective of my project and why it is important to study the protein/enzyme that we study and how it may help preserve normal brain function post-sepsis.

How would you like to see your research field 10-20 years down the line?

The research area for my dissertation project is on sepsis. I hope that 10-20 years down the line there are better tools to diagnose and treat sepsis beyond the use of antibiotics and fluid management. Such findings will not only resolve the long-term cognitive impairment seen in sepsis but will also curb a key complication (i.e sepsis) which is often comorbid with numerous diseases (e.g. cancer, stroke etc.).

Do you have any specific habits that have helped you become a prolific writer?

Collaborations within and beyond your lab is truly the key to becoming a prolific writer. There are numerous opportunities to collaborate at WVU. Furthermore, I have also found that labs that encourage co-lab members to participate/contribute in each other's projects tend to have a fruitful number of publications. Nevertheless, it is also important not to lose sight of your dissertation project.

What's the best piece of advice you ever received and what advice would you give to other young scientists?

Advice I got: It is very easy to get frustrated in science because of the emphasis on generating positive data. Don't forget to cherish the negative data because it also contributes to the knowledge gap you are trying to fill. This piece of advice truly embodies why we have all chosen to pursue a career in research. The zeal to keep forging ahead, poking, and prying with a purpose.

My advice: Netflix is just as important as your p-value. Don't forget the most important aspect of this journey is your wellbeing, take a deep breath, and try again tomorrow.

ANNOUNCEMENTS

- 1) ***Congratulations to Dr. Elizabeth Engler-Chiurazzi for being awarded a new K01 grant from the National Institute of Mental Health (NIMH).***
- 2) ***Drs Finomore, Galster and Hagen received two grants recently. One from the Office of Naval Research and the other from the Air Force Research Laboratory. Congrats to the Human Performance Team!***
- 3) ***Congratulation to Dr. Hunter Zhang who received an NICHD SBIR Phase II grant.***
- 4) ***WVU Rockefeller Neuroscience Institute (RNI) is the first in the state to use deep brain stimulation to treat epilepsy***
- 5) ***Dr. Zachary Weil received a contract from the Ohio River Valley Regional Traumatic Brain Injury Program. Congratulations!***
- 6) ***The WVU RNI is among the first in the world to initiate clinical trials using deep brain stimulation to block opioid addiction.***

OUTREACH



FEED OUR BRAINS UPDATE

Dr. Elizabeth Engler-Chiurazzi and the Neuroscience graduate and undergraduate students have continued their brain awareness outreach through the Feed Our Brains program. They have raised over \$1,700.00 through their fundraising efforts to donate to Monongalia County schools to pay unpaid student lunch bills.

They are currently planning the 2nd Brain Camp to be held July 12 – 18, 2020. Brain Camp is a unique, immersive science-based camp experience. A wide range of neuroscience related topics will be discussed through lectures, activities, and hands-on lab demonstrations.

TRAIN OUR BRAINS

The Neuroscience Outreach Team attended the WV State Fair August 16 - 17, 2019 as part of the WVU Extension Services' exhibition to highlight departments and programs at WVU. They taught hundreds of people from across WV, as well as parts of Virginia and Ohio, about the brain. Activities included: making pipe cleaner neurons, brain models, and "the claw," which allows participants to use the electrical impulses of their arm muscles to operate a mechanical claw to pick-up various items.

Dr. Elizabeth Engler-Chiurazzi visited Morgantown High School on December 2, 2019, to help students learn more about the brain in preparation for the AP psychology exam in the spring.

On January 20, 2020, the team visited the WV State Capitol as part of WVU Day at the Legislature, utilizing the same activities, pipe cleaner neurons and "the claw", to teach 4-H'ers, students, parents, and other visitors about the brain.

The Neuroscience Outreach team will be visiting North Elementary on Friday, April 24, 2020, to engage students in Neuroscience activities to teach them about the brain and the importance of good nutrition for brain development.

STUDENT ACCOMPLISHMENTS & AWARDS

- *J.Z. Cavendish*
 - **Publication** – **J.Z. Cavendish, S.N. Sarkar, M.A. Colantonio, D.D. Quintana, N. Ahmed, B.A. White, E.B. Engler-Chiurazzi and J.W. Simpkins**, Mitochondrial Movement and Number Deficit in Embryonic Cortical Neurons from 3xTg-AD Mice, **J Alzheimers Dis.** 2019;70(1):139-151.
 - *Jessica Cunningham*
 - **Poster Presentation** – **Presented her research "The multifaceted roles for JNK in forebrain development" at the 49th Annual Meeting of the Society for Neuroscience in October. Chicago, IL, USA.**
 - **Talk** – **Presented her research "A novel requirement for JNK signaling in axon pathfinding" at the Neuroscience Research Forum on October 31, 2019.**
 - **Travel Award** - **Received a Travel Award from the Cell Biology Training Program to attend the American Physician Scientist Association (APSA) national meeting in April.**
 - **Accepted Manuscript** – **Myers AK, Cunningham JG, Smith SE, Snow JP, Smoot CA, Tucker ES.** JNK signaling is required for proper tangential migration and laminar allocation of cortical interneurons. **Development.**
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Morgantown, WV

2020;147(2): dev180646. Published 2020 Jan 17. doi:10.1242/dev.180646

Cover art was selected for the issue.

- **Rachel Hostetler**
 - **Poster Presentation** – Presented her research “Distinguishing between layer 1 and layer 4 projecting somatostatin-containing interneurons using pial deposited Fast Blue due” at the **32nd annual Barrels conference** in October.
- **Mason McCollum**
 - **Poster Presentation** – Mason presented at his first international conference in San Jose. **Mason McCollum; Philip Bender; Charles T. Anderson**. *Synaptic Zinc Shapes the Sound-Evoked Responses of Corticocollicular Neurons in the Auditory Cortex*. *Association for Research in Otolaryngology (ARO) Midwinter Meeting*; 43, 829.
- **Divine Nwafor**
 - **Award** - American Physician Scientist Association (APSA) conference travel award.
 - **Accepted manuscript** – **Divine Nwafor, Allison L. Brichacek, Sreeparna Chakraborty, Catheryne A. Gambill, Stanley A. Benkovic, and Candice M. Brown** (2019). *Neuroendocrine and Neuroimmune Mechanisms Regulating the Blood-Brain Barrier*. **Oxford Encyclopedia of Neuroendocrine and Autonomic Systems**, ed. Randy J. Nelson. New York and Oxford: Oxford University Press.
 - **Accepted manuscript** – **Bornali Kundu, MD, PhD*, Brandon Lucke-Wold, MD, PhD*, Chase Foster, MD, Dario J. Englot, MD, PhD, Ogaga Urhie, Divine Nwafor, John D. Rolston, MD, PhD.** (2019). *Fornicotomy for the Treatment of Epilepsy: a Re-examination of the Literature*. **Journal of Neurosurgery** (accepted Nov. 12, 2019)
 - **Accepted manuscript** – **Allison L. Brichacek, Stanley A. Benkovic, Sreeparna Chakraborty, Divine C. Nwafor, Wei Wang, Sujung Jun, Werner J. Geldenhuys, Anthony B. Pinkerton, José Luis Millán, Candice M. Brown** (2019). *Inhibition of tissue nonspecific alkaline phosphatase alters the brain-immune axis in experimental sepsis*. **Scientific Reports**. (accepted Nov. 19, 2019)
 - **Accepted manuscript** – **Divine C. Nwafor, Sreeparna Chakraborty, Allison L. Brichacek, Sujung jun, Wei Wang, Elizabeth Engler-Chiurazzi, Duaa Dakhlallah, Anthony Pinkerton, José Luis Millán, Stanley A. Benkovic and Candice M. Brown** (2019). *Loss of tissue-nonspecific alkaline phosphatase (TNAP) enzyme activity in cerebral microvessels is coupled to persistent neuroinflammation and behavioral deficits in late sepsis*. **Brain, Behavior and Immunity** (accepted Nov. 20, 2019)
- **Tiffany Petrisko**
 - Successfully **graduated** from the Neuroscience Graduate Program and began her Post-Doctoral fellowship at the University of California, Irvine.
 - **Poster Presentation** – **Petrisko TJ, Bloemer J, Srinivas S, Pinky P, Du Y, Setti, S, Hong H, Suppiramaniam V, Konat GW, Reed MN.** (2019). *Induction of Cerebral Hyperexcitability by Peripheral Viral Challenge is Mediated by CXCL10*. 046.10 / E5. **49th Annual Meeting of the Society for Neuroscience** in October. Chicago, IL, USA.
 - **Poster Presentation** – **Petrisko, T.J., Nelson, R.J., White, B.A., Stewart, E.L., Prunty, M.A., Engler-Chiurazzi, E.B.** (2019). *Feeding Our Brains in West Virginia: Coupling neuroscience education with strategic philanthropy as a novel approach to engaging in brain awareness outreach and promoting social embeddedness in the local community*. 026.02SU /DD34. **49th Annual Meeting of the Society for Neuroscience** in October. Chicago, IL, USA.

- *Dominic Quintana*
 - **Publication** – **D. D. Quintana, S. E. Lewis, Y. Anantula, J. A. Garcia, S. N. Sarkar, J. Z. Cavendish, C. M. Brown and J. W. Simpkins, The Cerebral Angiome: High Resolution MicroCT Imaging of the Whole Brain Cerebrovasculature in Female and Male Mice, *Neuroimage*, in press, 2019.**
- *Catherine Smoot*
 - **Poster Presentation** – **Smoot CA, Wasef KA, Tucker ES. “Map3k12 binding inhibitory protein (Mbip) function establishes the appropriate number of cortical interneurons.” Poster session presented at The 49th annual Society for Neuroscience (SfN) meeting; October 19, 2019; Chicago, IL.**
- *Anton Sobinov*
 - **Successfully graduated from the Neuroscience Graduate Program and began his Post-Doctoral fellowship at the University of Chicago.**
- *Ariel Thomas*
 - **Poster Presentation** – **Thomas, A., Hardesty, R.L., Gritsenko, V. (2019). Functional Electrical Stimulation Helps Support the Weight of the Arm During Reaching and Grasping Movements. Dynamic Poster presented at Society for Neuroscience Annual Meeting. Chicago, Illinois.**
 - **Poster Presentation** – **Thomas, A., Hardesty, R.L., Gritsenko, V. (2019). Shoulder Functional Electrical Stimulation Reduces the Effort to Overcome Gravity During Reaching Movements. Poster presented at RehabWeek Conference, Toronto, Canada.**
 - **Publication** – **Thomas A.B., Olesh E., Adcock A., Gritsenko V. Force-based assessment distinguishes between the age-related and post-stroke changes in the neural control of reaching, *BioRxiv* 642272 [Preprint] September 18, 2019. Available from: <https://doi.org/10.1101/642272>.**
- *Paula Webster*
 - **Accepted Manuscript** – **“Processing of real-world, dynamic natural stimuli in autism is linked to corticobasal function” accepted to *Autism Research (the journal of the International Society for Autism Research)***

NEXT STEPS FOR OUR ALUMNI



Dr. Tiffany Petrisko started her postdoctoral studies at the University of California, Irvine



Dr. Anton Sobinov started his postdoctoral studies at the University of Chicago



P.I.C.K. WVU NEUROSCIENCE

Purpose
Innovation
Collaboration
Knowledge