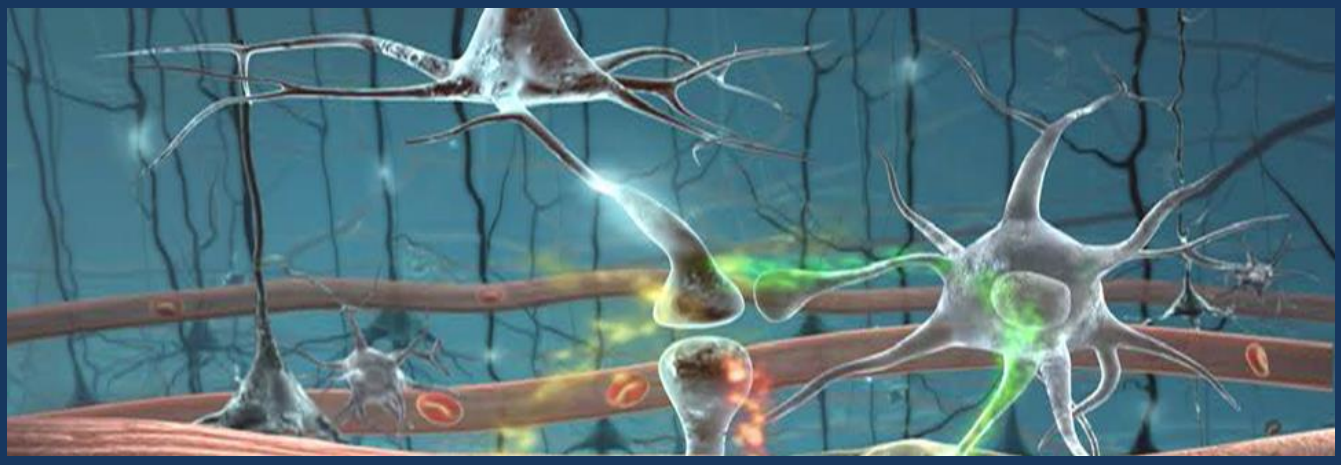
ENDURE

NIH Blueprint for Neuroscience Research



9th Annual Enhancing Neuroscience Diversity through Undergraduate Research Education Experiences (ENDURE) Meeting

October 19, 2019 | Chicago, IL

The NIH Office of the Director and these NIH Institutes and Centers participate in the NIH Blueprint for Neuroscience Research:

- NCATS
- NCCIH
- NEI
- NIA
- NIAAA
- NIBIB
- NICHD
- NIDA
- NIDCR
- NIEHS
- NIMH
- NINDS
- NINR
- OBSSR

NIH Blueprint for Neuroscience Research

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ENDURE PROGRAM GOALS

The NIH Blueprint for Neuroscience Research initiative, "Enhancing Neuroscience Diversity through Undergraduate Research Education Experiences (ENDURE)," aims to raise interest and opportunities in neuroscience research for individuals who are typically underrepresented in the neurosciences. The goal is to provide such individuals with training at the undergraduate level, so that they are prepared to enter and successfully complete neuroscience Ph.D. programs. ENDURE provides undergraduate training through partnerships between research-intensive institutions and institutions with a substantial enrollment of neuroscience majors from diverse groups. This includes individuals from underrepresented racial and ethnic groups; individuals with disabilities; and individuals from economically disadvantaged backgrounds. ENDURE undergraduate training programs support a range of activities to increase student interest and involvement in the neurosciences, including research experiences, core and advanced neuroscience courses, seminars, and journal clubs. In FY10, five ENDURE awards were granted. In FY15, six ENDURE awards were granted. In FY19, six ENDURE awards were granted.

ENDURE MEETING GOALS

As issued, the most recent RFA (RFA-NS-19-007) cites "it is a goal of this initiative that the NIH Blueprint Institutes will convene an annual meeting that will bring together BP-ENDURE program directors and participating students." The purpose of the meeting will be to discuss best practices and provide a forum for student scientific and academic enhancing activities. An additional goal and outcome for this annual meeting is to provide linkage and opportunity for collaboration with existing diversity (example: Neuroscience Scholars Program) and undergraduate (example: Faculty for Undergraduate Neuroscience) programs already at Society for Neuroscience. The students will enhance their networks with other ENDURE participants, peer mentoring from diverse graduate students, and T32 program directors.

ORGANIZING COMMITTEE

Dr. Michelle Jones-London (NIH/NINDS)

Dr. Marguerite Matthews (NIH/NINDS)

Dr. Lauren Ullrich (NIH/NINDS)

Dr. Mark Chavez (NIH/NIMH)

Andrew Nawrot (NIH/NIMH)

Jonelle Duke (The Bizzell Group)

For further information about ENDURE and its training sites:

https://neuroscienceblueprint.nih.gov/endure-undergraduate-education

Visit and like the ENDURE Facebook page: An ENDUREing Network – www.facebook.com/BP.ENDURE

Follow NINDS Office of Programs to Enhance Neuroscience Workforce Diversity on Twitter @NINDSDiversity

The ENDURE FOA will be re-issued!

Applications will be due February 19, 2020

Notice of Intent to Publish a Funding Opportunity Announcement for NIH Blueprint Program for Enhancing Neuroscience Diversity through Undergraduate Research Education Experiences (R25 Clinical Trial Not Allowed)

Notice Number: NOT-NS-20-009

Key Dates

Release Date: September 16, 2019
Estimated Publication Date of Funding Opportunity Announcement: October 10, 2019
First Estimated Application Due Date: February 19, 2020
Earliest Estimated Award Date: September 01, 2020
Earliest Estimated Start Date: December 01, 2020

Purpose

The National Institutes of Health (NIH) Blueprint for Neuroscience Research intends to reissue a Funding Opportunity Announcement (FOA) for receipt of new and renewal applications for its research education program for neuroscience focused undergraduates. The overall objective of this funding opportunity will be to increase the number of undergraduate participants from diverse groups who successfully enter and complete Ph.D. degree programs in the neurosciences. To accomplish this goal, this initiative would support the development of collaborative research education partnerships to increase participants' awareness and interest in the neurosciences, develop participants' scientific knowledge and research skills that would allow them to progress and transition to more advanced neuroscience related research education and training activities, and establish working networks within existing Ph.D. degree granting and NIH-supported predoctoral T32 neuroscience programs.

This Notice is being provided to allow potential applicants sufficient time to develop meaningful collaborations and responsive projects.

The FOA is expected to be published late November 2019 with an expected application due date in February 2020.

This FOA will utilize the R25 activity code.

Research Initiative Details

The overarching objective of this funding opportunity is to encourage individuals from diverse backgrounds, including those from groups underrepresented in the biomedical, behavioral, and clinical research workforce, to pursue further studies or careers in neuroscience research. To achieve this goal, the initiative will support **two-year** neuroscience research education programs comprised of year-round authentic neuroscience research experiences, research and career development, and establishment of professional networks, implemented through collaborative partnerships integrated across different educational institution types.

The future FOA is expected to continue the overarching objective of the 2019 NIH Blueprint R25 FOA: RFA-NS-19-007.

Inquiries

Please direct all inquiries to:
Michelle D. Jones-London, Ph.D.
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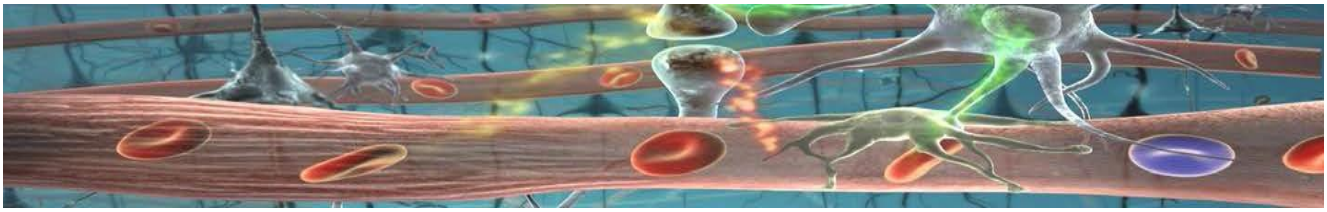

Enhancing Neuroscience Diversity through Undergraduate Research Education Experiences (ENDURE) 9th Annual Meeting

Hyatt Regency McCormick Place, Regency Ballrooms AB
October 19, 2019

7:00 – 7:30 am **Registration**

7:30 – 7:40 am **ENDURE Meeting Goals and Introduction**
Dr. Michelle Jones-London, Chief, Office of Programs to Enhance Neuroscience Workforce Diversity (OPEN), National Institute of Neurological Disorders and Stroke (NINDS)

7:40 – 8:05 am **NIH Blueprint Welcome and Scientific Presentation**
Dr. David Shurtleff, Deputy Director, National Center for Complementary and Integrative Health (NCCIH)

Q&A

8:05 – 9:45 am **Panel on "Pathways and Perspectives on Being a Researcher"**
Chair and Panel Introductions: Dr. Ashlee Van't Veer, Office of Research Training and Career Development, Division of Neuroscience and Basic Behavioral Science, National Institute of Mental Health (NIMH)

A discussion framed by several specific questions: *What a graduate student should expect both of the school and themselves? How to identify a good mentor? Why a career in neuroscience research is fulfilling? How do I prepare for and navigate some of the challenges of graduate school?*

Each accomplished researcher on the panel will share their research background and answer questions relevant to their experiences, including early lessons from graduate school, being an underrepresented neuroscientist, and pursuing a research career.

Panelists:
- Ms. Kaela S. Singleton – 2012-2014 ENDURE Alum, 2018 D-SPAN Scholar and Ph.D. Candidate at Georgetown University
- Dr. Ishmail Abdus-Saboor – Mitchell J. and Margo K. Blutt Presidential Assistant Professor of Biology at the University of Pennsylvania
- Dr. Daniel Colón-Ramos – Associate Professor of Neuroscience and Cell Biology at Yale University School of Medicine

9:45 – 11:30 am **Graduate Program Recruitment and Networking Fair**
Institutions with a strong record of neuroscience training and interested in recruiting for predoctoral research programs.

NIH BLUEPRINT FOR NEUROSCIENCE RESEARCH

The NIH Blueprint for Neuroscience Research, known as "Blueprint", is a collaborative framework that includes the NIH Office of the Director and 14 NIH Institutes and Centers that support research on the nervous system. By pooling resources and expertise, Blueprint identifies cross-cutting areas of research, and confronts challenges too large for any single Institute or Center.

This year's NIH Blueprint welcome is presented by Dr. David Shurtleff, NCCIH

David Shurtleff, Ph.D.
Deputy Director, National Center for Complementary and Integrative Health (NCCIH)

David Shurtleff, Ph.D., is Deputy Director of the National Center for Complementary and Integrative Health (NCCIH), performing a wide range of activities aimed toward directing, and implementing a program of research that builds a scientific evidence base about complementary and integrative health approaches that advances fundamental knowledge, and informs decision making by the public, by health care professionals, and by health policymakers.

Dr. Shurtleff's 24-year career at the National Institutes of Health (NIH) has focused on providing leadership and fostering an extensive research portfolio in the basic behavioral and neurosciences—cognitive studies, behavioral economics, decision theory —and a broad spectrum of research that has contributed to cutting-edge research related to drug abuse, addiction, and complementary and integrative health care. Dr. Shurtleff began his NIH career in 1995 at the National Institute on Drug Abuse (NIDA). From 2001 to 2010, he served as the Director of the Division of Basic Neuroscience and Behavioral Research at NIDA. From January 2011 to June 2013, he served as the Acting Deputy Director of NIDA.

Before coming to NIH, Dr. Shurtleff was a research psychologist at the Naval Medical Research Institute (NMRI), where he conducted research related to cognitive performance, and environmental stress. Prior to joining NMRI, he was a research fellow at the Walter Reed Army Institute of Research. He has received various honors and awards including several NIH Director's Awards. One of these awards recognized his outstanding contributions to the 2014 President's BRAIN Initiative.

PANEL SPEAKERS

Each accomplished researcher will share their research background and answer general questions from their respective lens including early lessons from graduate school, being a diverse scientist, and the big picture view of a research career.

Kaela S. Singleton
Ph.D. Candidate, Interdisciplinary Program of Neuroscience
Georgetown University

Kaela S. Singleton is a Ph.D. candidate in the Interdisciplinary Program of Neuroscience at Georgetown University (GU). She is interested in how neurons gain unique identity and function during development. Her thesis research addresses this by utilizing multiple species and molecular techniques to investigate how transcription factor function changes throughout neural development and between mammalian and non-mammalian models. Born in Texas and raised in Grayson, Georgia, Kaela earned a B.S. in Neuroscience and Classical History & Culture from Agnes Scott College where she earned the BP-ENDURE fellowship. She conducted research at Emory, Georgia State, and Vanderbilt University investigating how disruption in cellular and molecular programs lead to various neurological disorders including stroke, Autism Spectrum Disorders, and Rett Syndrome. To date, Kaela has won spots on two GU T32s in integrative neuroscience and neural injury to further her research endeavors. She is a current D-SPAN Scholar, and co-authored and published five scientific manuscripts and six abstracts. She has presented her research at ten national conferences and continues to be active in the neuroscience community through teaching and outreach. She believes that the formation of a professional identity is similar to the formation of a neuron's identity, where both processes are driven by intrinsic and extrinsic factors that interact to create a mature and unique individual. Her goal is to aide in the development of students' professional identities while continuing to investigate the factors essential to a neuronal identity.

Ishmail Abdus-Saboor, Ph.D.
Mitchell J. and Margo K. Blutt Presidential Assistant Professor of Biology
University of Pennsylvania

Dr. Ishmail Abdus-Saboor was born and raised in Philadelphia and received his bachelor's degree in Animal Science from North Carolina A&T University in 2006, having completed internships in research labs in academia and industry, as well as a veterinary clinic and a farm. He earned his Ph.D. in Cell and Molecular Biology in 2012 with Meera Sundaram at the University of Pennsylvania studying signal transduction pathways during development of the roundworm C.elegans. His Ph.D. thesis work was supported by an NIH/NIGMS Genetics Training Grant and recognized with the Tom Kadesch Prize in Genetic Research. He completed postdoctoral training with Benjamin Shykind at Weill Cornell Medical College studying monoallelic gene expression of olfactory receptors and Wenqin Luo at the University of Pennsylvania studying neural circuit mechanisms for somatosensation. As a postdoctoral fellow his research was supported by an NIH/NIGMS K12 IRACDA fellowship, NIH/NIDCR K99, Burroughs Wellcome Fund Postdoctoral Enrichment Fellowship (PDEP), and recognized with the Mitchell Max Award in Pain Research from the NIH.

Ishmail opened his lab in July of 2018 as the Mitchell J. Blutt and Margo Krody Blutt Presidential Assistant Professor of Biology at the University of Pennsylvania. Ishmail is proud and humbled to be the first African-American faculty member in this department at Penn. In addition to generous startup funds from the university, the Abdus-Saboor lab is supported by an R00 Pathway to Independence grant from the NIH.

Daniel Colón-Ramos, Ph.D.
Associate Professor, Cellular Neuroscience
Yale University

Dr. Daniel Colón-Ramos is an Associate Professor of Cellular Neuroscience at Yale University and co-founder of Ciencia Puerto Rico. His lab at Yale studies the development and function of the nervous system, and their work has been recognized by a number of awards, including the NIH Pioneer Award, HHMI Scholar Award and the Sloan Fellowship. Prior to his appointment at Yale University, he was a Damon Runyon fellow in cellular neuroscience at Stanford University and a recipient of the NIH Pathways to Independence Award (K99/R00). Dr. Colón-Ramos has a Ph.D. in molecular genetics from Duke University School of Medicine and an A.B. in biology from Harvard University. In 2006, Dr. Colón-Ramos founded Ciencia Puerto Rico, a non-profit organization that promotes scientific research and education in the Puerto Rican archipelago and among Hispanics in the US. His outreach and research work have been recognized by the AAAS Early Career Award for Public Engagement with Science and the NIH Landis Mentoring Award.

Dr. Colón-Ramos will deliver the Neuroscience 2019 Presidential Special Lecture, “The Cell Biology of the Synapse and Behavior,” on Monday, October 21, 2019, at McCormick Place Convention Center, Hall B.

BP-ENDURE AT HUNTER & NYU

HUNTER COLLEGE

http://www.bpendure.org/

Principal Investigator: Glenn Schafe, Ph.D. | Hunter College of CUNY

Principal Investigator: Nesha Star Burghardt, Ph.D. | Hunter College of CUNY

Principal Investigator: Chiye Aoki, Ph.D. | New York University

Partner Institution: New York University

Program Description

Hunter College of the City University of New York (CUNY) recognizes that increasing the number of highly qualified neuroscientists from these underrepresented populations is integral to our future as an academic and research institution. Hunter College aims to increase the number of well-trained, diverse neuroscientists. The overall goal of this application is to develop a neuroscience training program at Hunter that will encourage and prepare students from diverse backgrounds to enter into and succeed in Ph.D. programs in the neurosciences.

Hunter has developed a research-educational partnership with four outstanding T32- awarded universities: New York University, Brown University, University of Michigan, and Vanderbilt University. This partnership will expose 12 BP-ENDURE-trainee students per year to a research-intensive curriculum and an environment of excellence and active research. Moreover, because of the diversity of the proposed mentors, students will be exposed to a broad spectrum of researchers, including basic neuroscientists interested in central nervous system (CNS) issues and applied neuroscientists from the areas of clinical, social, health, developmental, and cognitive neuropsychology.

To achieve our goals, the following aims are proposed: (1) to develop an outstanding group of undergraduate students with diverse backgrounds dedicated to neuroscience research; (2) to provide scientific skill and research experiences to our trainees through research placement with actively funded neuroscientists; (3) to develop academic development and curriculum enhancement activities rooted in the student's research activities; and (4) to maintain an effective Administrative Core to support our students' needs and development.

Our measurable objectives during the requested funding period include: (1) 85 to 90% acceptance of trainees to graduate school programs in neuroscience; (2) improvement of our students in quantitative skills and academic achievements, as well as their (3) scientific writing and oral presentations. Outcomes from evaluations of the Steering Committee, the external evaluator, and the Administrative Core will guide future modifications to our training initiatives.

Additional Program Team Members

Program Administrator: Kizzy Vazquez | Hunter College of CUNY

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Ayomiposi Adewakun

Home Institution: New York University

Email: aba407@nyu.edu

Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Neural Science, 2021

Mentors at Home Institution: Dr. Robert Froemke, Dr. Margarita Kaplow

Scientific Interests: I am interested in studying behavior and how external factors, such as sensation, can affect behavior. I currently conduct research in the Froemke lab studying the effects of stimulating activity in the vagus nerve, the tenth cranial nerve that regulates activity of internal organs, and, specifically, how vagus nerve stimulation affects cognition and social behavior. I am also interested in cellular and molecular neuroscience and the role of genetics in learning and neurodevelopmental disorders.

Career Goals and Plan: I am planning to pursue a doctorate in neuroscience with the goal of becoming a professor at an active research university in the future. I want to focus on systems neuroscience and the question of how large brain networks and neural circuits interact to produce complex behaviors. I am also interested in cellular/molecular neuroscience and the question of how differences in neuron morphology and function lead to the development of larger brain networks that regulate and influence learning and behavior, as well as how alterations in these mechanisms can lead to the presences of neurological disorders.

ENDURE Summer Research Experience

Research Experience Institution: University of Michigan

Research Mentors: Dr. Shigeki Iwase, Katie Bonefas

Diversity Poster Session: Theme A: Development, L-1

Project Title: Investigating the Unique Roles of LSD1 and KDM5C Histone Demethylases in Neurodevelopment Through the Characterization of Microexons

Abstract: Misregulation of H3K4 methylation results in neurodevelopmental disorders. However, the proteins involved in regulation of H3K4 are ubiquitously and constitutively expressed, making it difficult to determine the exact mechanisms behind this regulation. Recent evidence has suggested that there are specific microexons that exist in the neuronal form of each demethylase, implying a unique role in neurons. These demethylases must act in a time-dependent manner for proper neurodevelopment. We focus on two demethylases: KDM5C and LSD1. To determine if there are KDM5C microexons unique to neurons, we compared microexon expression in neuronal and MEF cells. To dissect the temporal roles of chromatin regulators, we adapted a novel system of protein regulation; we inserted -LID or -DD domains to previously verified neuronal and canonical isoforms of LSD1. We found that KDM5C neuronal and canonical isoforms contain negligible differences when analyzed with agarose and polyacrylamide gels, and that LSD1 plasmid isoforms containing either -LID or -DD can be generated successfully. Future studies will involve sequencing the KDM5C isoforms to identify gene sequence differences, and protein transcription of KDM5C & LSD1 neuronal and canonical variants to identify differences in their function in the brain versus their function in the rest of the body.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Estephanie Balbuena

Home Institution: Hunter College of CUNY

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Psychology and English, 2020

Mentor at Home Institution: Dr. Mariann Weierich

Scientific Interests: I am interested in studying neural networks underlying stress-related disorders. I am using fMRI to research cerebellar resting-state functional connectivity, a common index of baseline functional coupling of neural circuits, with the limbic system across different periods of development. The cerebellum is more commonly known for its role in motor function but is also implicated in affect processing and other cognitive functions. Exploring cerebello-limbic connectivity in trauma-exposed individuals across different developmental stages may provide insight on the role of the cerebellum in the processing of affective information and may provide evidence of the neural mechanisms that underlie this process.

Career Goals and Plan: I will graduate from Hunter College in May 2020 with bachelor's degrees in psychology and English, and a minor in biology. I plan to pursue a Ph.D. in neuroscience and a career in academia as a principal investigator. One of my major research goals is to further my interest in the study of neural networks in the brain with relation to the physiological effects associated with stress-related disorders. Additionally, I am interested in researching the neural mechanisms that underlie loss of function within the nervous system following a traumatic injury.

ENDURE Summer Research Experience

Research Experience Institution: Yale University

Research Mentors: Dr. William Cafferty, Noa Golan

Diversity Poster Session: Theme E: Motor Systems, N-3

Project Title: Characterization of the Adult Corticospinal Tract

Abstract: Spinal cord injury (SCI) results in lasting motor and sensory deficits. However, acutely post trauma patients experience a modest amount of spontaneous functional recovery, thought to be a result of plasticity of intact central nervous system axons. Understanding the molecular mechanisms that support functional plasticity will drive the development of spatially and temporally specific therapeutic interventions. The corticospinal tract (CST) provides a unique opportunity to explore these mechanisms as it is plastic after injury and its axons grow postnatally, providing access for transcriptional profiling during growth, maintenance and after injury. To date, there are no studies that complete a comprehensive molecular characterization of neurons in this tract. To this end, we explored the veracity of the transgenic mouse line rbp4-cre to label the entire CST for molecular characterization. We injected a retrograde AAV expressing GFP into the cervical enlargement in adult rbp4-cre:Ai14 mice and assessed the overlap in expression of reporter encoded Td-tomato and retrogradely traced GFP expression in CST neuronal cell bodies. Our data show that only 80% of traced cells were rbp4+, suggesting that this transgenic line is not a comprehensive CST marker. On-going studies will utilize the retrograde approach to label CST somata for subsequent single cell transcriptional analyses.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Alicia Chime

Home Institution: New York University

Email: anc477@nyu.com

Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Neural Science, 2020

Mentor at Home Institution: Dr. Margarita Kaplow

Scientific Interests: As a student in the ENDURE program, my scientific interests include understanding and investigating the neural circuitry that underlies neurodegenerative diseases, such as Parkinson's Disease and other movement disorders associated with the brain. With that, I am interested in research that investigates both the behavioral and molecular aspects of movement disorders with the goal of effectively enhancing treatment for affected individuals as well as being able to recognize these disorders earlier in life.

Career Goals and Plan: My academic goal is to focus on obtaining a bachelor's degree in neuroscience and work in a laboratory that prepares me for an academic career in neuroscience research as well as challenge me to meet milestones that will propel me in the right direction as I apply for graduate school.

ENDURE Summer Research Experience

Research Experience Institution: University of Michigan

Research Mentor: Dr. Dan Leventhal

Diversity Poster Session: Theme E: Motor Systems, N-6

Project Title: Influence of Cholinergic Interneurons on Fine Motor Skill Learning and Performance

Abstract: Cholinergic interneurons makeup a small population (1-3%) of neurons in the striatum and have a characteristic pause activity when they receive glutamatergic input from the thalamus and cerebral cortex. It is also known that these interneurons are very important for striatal plasticity as they have long axons that provide sufficient innervation in the striatum and hence are critical for complex movements. Based on this knowledge, we predict that these interneurons are important for learning motor skills, but not for performing these skills once they have been well-learned. To test this hypothesis, rats were trained on a skilled reaching task that required paw movements to obtain sugar pellets using multi-joint and digit control. Rats were divided into 2 groups, a 'learning' group and a 'performance' group. Rats in both groups were delivered a toxin (ChAT-SAP) into the striatum that targets and lesions cholinergic interneurons. After receiving the lesions, rats in both groups were tested in the skilled task for a duration of 6 days. The effects of the loss of cholinergic interneurons were measured by analyzing success rate and changes in kinematics.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Aziz Elbasheir

Home Institution: Hunter College of CUNY

Email: aelbasheir3@gmail.com

Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Psychology, 2019

Mentor at Home Institution: Dr. Amber Alliger

Scientific Interests: I am interested in understanding the neuroanatomical and physiological underpinnings of major depressive disorder and post-traumatic stress disorder. Specifically, the literature parses mood and cognitive deficits as their own domains so I want to examine the cognitive deficits observed in these disorders such as in learning and memory. Moreover, the limited efficacy of monoaminergic based therapeutics is well established, so I want to explore other chemical systems in the brain such the glutamatergic system as an alternative route toward remitting these cognitive deficits.

Career Goals and Plan: Post undergrad, I plan to pursue a Ph.D. in the neurosciences and focus on expanding our knowledge on the pathophysiology of major depressive disorder and post-traumatic stress disorder. Upon getting my Ph.D. I would hope to obtain a postdoctoral position and eventually an academic position in a university where I can start my own lab. Mentoring and conveying information is very essential to me, so I am very keen on lecturing as well during my time as a faculty member.

ENDURE Summer Research Experience

Research Experience Institution: Yale University

Research Mentor: Dr. Irina Esterlis

Diversity Poster Session: Theme H: Cognition, O-29

Project Title: *In vivo* Investigation of the Relationship between mGluR5 Availability and Cognitive Deficits in Major Depressive and Post-Traumatic Stress Disorders

Abstract: Limited efficacy of monoaminergic therapeutics for mood and anxiety disorders has motivated recent examination of the glutamatergic system for alternative treatment targets. The metabotropic glutamate receptor type 5 (mGluR5) is a potential target given its role in emotion regulation, fear learning, and cognition. We quantified mGluR5 availability *in vivo* using [18F]FPEB positron emission tomography in individuals with major depressive disorder (MDD; n = 33), post-traumatic stress disorder (PTSD; n = 31), and healthy controls (HC; n = 54) to evaluate the relationship between mGluR5 availability and cognitive functioning. Participants completed a computerized battery of cognitive assessments to evaluate working memory, attention/psychomotor speed and executive functioning. We observed higher mGluR5 availability in individuals with PTSD compared to MDD and HC (p's = .02-.05), and a difference in executive functioning performance in MDD compared to HC (p = .008). Further, using MANOVA analysis in the full sample, we observed an interaction between working memory and diagnosis on mGluR5 (p = .046), which suggests a relationship between mGluR5 availability and working memory performance across diagnostic groups. These findings will help elucidate the role of the glutamatergic system in MDD and PTSD, and the potential therapeutic properties of mGluR5 for cognitive deficits related to these disorders.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Rufina Kamaletdinova

Home Institution: Hunter College of CUNY

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Biology, 2020

Mentors at Home Institution: Dr. Allyson Friedman, Dr. Adrienne Alaie, Dr. Glenn Schafe

Scientific Interests: I am interested in studying molecular mechanisms underlying the development of neuropsychiatric disorders. I work in the laboratory of Dr. Allyson Friedman, where I am investigating a role of the mesocorticolimbic pathway in resilience to stress, a known predisposing factor in the development of psychiatric disorders. I am interested in understanding how regulating the activity levels of prefrontal cortex (PFC) cells projecting to the ventral tegmental area (VTA) of the brain creates resilience to stress, as well as the neurophysiological characteristics of such PFC cells.

Career Goals and Plan: I am planning to pursue a doctorate in the biomedical sciences and hope to ultimately become a faculty member and principal investigator at a major research university. My areas of interest include understanding of molecular mechanisms behind psychiatric and neurological disorders and their implications in behavior.

ENDURE Summer Research Experience

Research Experience Institution: Yale University

Research Mentors: Dr. Marina Picciotto, Richard Crouse

Diversity Poster Session: Theme G: Motivation and Emotion, O-6

Project Title: Amygdala Cholinergic Circuit Dynamics in Appetitive Learning

Abstract: The basolateral amygdala (BLA) is important for learning that a neutral cue can predict a reward. It receives strong input from basal forebrain acetylcholine (ACh) neurons, but their role in forming these associations is not well understood. We examined the changes in the level of ACh release in the BLA using a novel ACh sensor (GACh) throughout a learning paradigm in which mice learn that a cue predicts onset of a trial when a nose poke leads to delivery of reward. Mice expressing the GACh sensor showed an increase in BLA ACh levels time-locked to the correct nose poke onset, which shifted over time to be associated with the tone cue preceding a proper nose poke. These findings suggest that release of ACh in BLA may play a critical role in regulating neural plasticity underlying acquisition of reward-driven associative learning tasks. Evaluating the dynamics of ACh signaling in this circuit is important for understanding both the role of cholinergic input in fundamental amygdala-dependent learning and memory process, and how malfunction may contribute to neuropsychiatric disease such as addiction.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Raisa Karim

Home Institution: Hunter College of CUNY

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Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Biochemistry, 2021

Mentors at Home Institution: Kizzy Vazquez, Dr. Allyson Friedman, Dr. Gabriela Smeureanu

Scientific Interests: My scientific and research interests include the BLA (basolateral amygdala), prefrontal cortex, VTA (ventral tegmental area), and nucleus accumbens, and their respective roles in reward, aversion, stress, and resilience. I will specifically be working on cell counting in the VTA region for estrogen receptors. I hope to improve my statistical analysis skills as well my scientific writing skills, as I will be helping to write the results section of the paper. I will also be running the RNAscope technique used prior to cell counting.

Career Goals and Plan: I am pursuing an M.D./Ph.D. in neuroscience program after completing my undergraduate education. I aspire to do an M.D./Ph.D. because I want to be able to connect the bench work setting to the clinical setting. I hope to serve minority communities in the future or do relief work in international locations with inadequate healthcare.

ENDURE Summer Research Experience

Research Experience Institution: New York University

Research Mentors: Dr. Adam Carter, Dr. Corey Baimel, Dr. Chiye Aoki

Diversity Poster Session: Theme F: Integrative Physiology and Behavior, N-22

Project Title: Valence Encoding in Basolateral Amygdala to Nucleus Accumbens Projections

Abstract: To thrive optimally in society, we act and adapt in order to maximize the number of rewards and to minimize the amount of punishment we procure, actions determined by activation of reward and aversion encoding pathways in the brain. The basolateral amygdala (BLA) is a region of the brain that is involved in the regulation of emotion and motivation. It receives and is activated by information about positive and negative environmental stimuli. The BLA encodes valence through multiple output projections to different areas of the brain, including to the nucleus accumbens (NAc). It is not known how information about positive and negative valence stimuli are routed from the BLA to different subregions of the NAc (medial shell, NAcMS, & lateral shell, NAcLS). We used a combination of fluorescent-tagged retrograde injections into mice and cFos immunohistochemistry to study the activation of populations to study the activation of populations of NAc-projecting neurons in the BLA to rewarding, aversive and neutral stimuli. We observed a high number of activated BLA to NAcMS projection neurons in response to all stimuli. We hope to understand which stimuli trigger BLA to NAcLS projections.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Emily Makowicz

Home Institution: Hunter College of CUNY

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Psychology and Biology, 2020

Scientific Interests: My interests mainly focus on molecular mechanisms of neural plasticity and neuronal degeneration. My research in the Aoki Lab at NYU enabled me to combine molecular and behavioral neuroscience approaches to study mechanisms underlying anorexia nervosa. I gained skills in using electron microscopy and immunocytochemistry to complement behavioral analyses that explored the interconnected circuits between the dorsal striatum and prefrontal cortex in a mouse model of anorexia nervosa.

Career Goals and Plan: In the future, I want to pursue a Ph.D. in neurobiology and behavior and continue my research as a future professor. In the long run, I would like to explore developmental plasticity at a molecular level to explore behavioral patterns in disorders and diseases.

ENDURE Summer Research Experience

Research Experience Institution: New York University

Research Mentor: Dr. Chiye Aoki

Diversity Poster Session: Theme B: Neural Excitability, Synapses, and Glia, L-32

Project Title: Investigation of DREADD Modulation of the Prefrontal Cortex-to-Dorsal Striatum Pathway and Anorexic Behavior in a Mouse Model

Abstract: Anorexia nervosa (AN) has the highest mortality rate among all mental illnesses but with no accepted pharmaceutical treatment. We used the Activity Based Anorexia (ABA) mouse model to study the neurobiology of AN. Prefrontal cortex-to-dorsal striatum pathway (PFC-DS) is known to modulate animals' feeding behaviors, but its role in ABA vulnerability is unknown. We selectively activated or suppressed PFC-DS using DREADDs and measured ABA vulnerability based on their body weight, food consumption during the 2 hours of food availability, and wheel exercise that are evoked by starvation. We found that selective activation of PFC-DS and global activation of all pyramidal neurons in PFC both increase animals' vulnerability to ABA (wheel running). Light microscopy revealed that 82% of DREADDs-expressing neurons were activated by the ligand. In contrast, only 5% of the DREADDs-expressing neurons suppressed by the ligand remained active. This level of pyramidal cell activity was comparable to the 7% level seen in the absence of DREADD modulation This demonstrates, for first time, a causal link between hunger-evoked hyperactivity and activation of PFC-DS. Suppression of PFC-DS may remedy AN.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Itzik Nahmoud

Home Institution: Hunter College of CUNY

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Undergraduate Academic Level: College Graduate

Undergraduate Major and Graduation Date: Biochemistry, 2019

Mentor at Home Institution: Dr. Ekaterina Likhtik

Scientific Interests: In Dr. Ekaterina Likhtik's systems neuroscience lab at Hunter College, I am using Pavlovian fear conditioning paradigms to investigate the neural circuitry underlying anxiety and anxiety-related disorders. I have further supplemented my basic neuroscience research training with oncology research in Dr. Michael Cooper's lab at Vanderbilt University, with a study that examines the development of human grade III anaplastic astrocytomas. In doing so, I have gained an expanded skill set utilizing immunofluorescence techniques to aid in mapping a new-found mosaic of cell functions which may lead to much-needed development of targeted therapeutics. I plan to continue pursuing basic research in the neurosciences while gaining additional exposure to various subdisciplines such as oncology or neuroeconomics.

Career Goals and Plan: I plan to matriculate into an M.D./Ph.D. program that will allow me to conduct basic science research and apply my findings in a translational setting. Neuroscience research allows me to actively investigate brain function using some of the most sophisticated technological tools available. A medical scientist career affords me the rare opportunity to act as a liaison between basic science and patient care in an attempt to discover novel clinically-relevant treatment approaches.

ENDURE Summer Research Experience

Research Experience Institution: Hunter College of CUNY

Research Mentor: Dr. Ekaterina Likhtik

Diversity Poster Session: Theme H: Cognition, O-39

Project Title: Auditory Safety Training Improves Novel Auditory Discrimination Learning

Abstract: Overgeneralized fear (OF) responses to threat and non-threat, is a core feature of anxiety. While research has focused on maladaptive fear learning in the emergence of OF, recent evidence suggests that maladaptive Safety Learning may play a unique role in OF. Yet, the independent influence of safety conditioning on OF is not understood. To address this question, we tested how safety conditioning protocols with varied levels of uncertainty compared to classic fear conditioning as to how they impact behavior on subsequent tests of innate anxiety and differential fear learning of new aversive and neutral cues. Using a high anxiety strain of mice, we show that animals undergoing fear conditioning using 5 pairings of a tone with a shock show little exploration of the anxiogenic center of an open field 24 hours later, and poor discrimination during new differential conditioning 7 days later. We then tested whether fear and safety conditioning differentially affect auditory discrimination curves. Mice that were fear conditioned showed freezing to all the presented tones, whereas mice that were safety conditioned showed a selective decrease in freezing to the trained target tone. These data suggest that safety conditioning sharpens auditory discrimination.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Ariel Nieves

Home Institution: Hunter College of CUNY

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Psychology, 2020

Mentor at Home Institution: Dr. Amber Alliger

Scientific Interests: Neuroinflammation and glial cell dysregulation in response to stress or traumatic brain injury can induce neural deficits and pathological changes that could lead to development of neurodegenerative diseases. However, we may be able to counteract this process by utilizing beneficial environmental factors, including enriched environments, to enhance neuroprotective glial cell function or induce neuro-repair. To that end, I am working in the laboratory of Drs. Serrano & Alliger on a project examining environmental enrichment as a neuroprotective factor against the deleterious effects of stress on inflammation in the hippocampus and hippocampal-dependent behavior.

Career Goals and Plan: I plan to pursue a research career in academia where I can continue investigating cellular and molecular mechanisms underlying stress-associated pathology and neurodegeneration. This fall I am taking the GRE and applying to neuroscience graduate programs to pursue my Ph.D. I am also in the process of writing my honors thesis and a research proposal for the National Science Foundation. In addition, I will be presenting research at various conferences such as Society for Neuroscience, Mount Sinai's Undergraduate Research Conference, and Hunter College's Undergraduate Research STEM Conference.

ENDURE Summer Research Experience

Research Experience Institution: Brown University

Research Mentor: Dr. David Berson

Diversity Poster Session: Theme B: Neural Excitability, Synapses, and Glia, L-38

Project Title: Reconstruction of Excitatory Bipolar Cell Input to Mouse ON Alpha-like Retinal Ganglion Cells with Electron Microscopy

Abstract: Retinal cells form specific circuits, transferring light information to the brain for higher visual processing. Retinal ganglion cells (RGCs) are a diverse group of neurons that encode information from inhibitory and excitatory inputs of intermediate cells before sorting it to specific brain regions. The diversity found in over 35 RGC subtypes is characterized by cell size, morphology, dendritic branching, and stratification in the sublayers of the inner plexiform layer (IPL). This diversity largely determines what synaptic connections RGCs can make, but the specific synaptic connections made by these RGCs have not been thoroughly investigated. Serial electron microscopy was used to create a high-resolution 3D reconstruction of a juvenile wild type mouse retina. We analyzed two recently discovered and previously grouped alpha-like RGCs that stratify in the same ON-sublayer of the IPL but differ in dendritic morphology. We hypothesized that these cells can be further differentiated through excitatory input from bipolar cell (BCs) ribbon synapses. Ribbons were manually marked in a tracing program before being compared to an archive of previously traced BCs. These cells exhibited a difference in frequency of BC inputs despite similar stratification, suggesting that other factors may specify how retinal circuitry is wired.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Ikponmwosa Pat-Osagie

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Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Psychology, 2020

Mentor at Home Institution: Dr. Peter Serrano

Scientific Interests: My research interest is the study of neurodegeneration and neuroplasticity, with respect to understanding the effects of drug addiction to these neurological properties.

Career Goals and Plan: My career goals are to purse a Ph.D. in behavior neuroscience and to work on research topics such as neuroregeneration, drug addiction, and memory consolidation, retrieval, retention, and formation.

ENDURE Research Experience

Research Experience Institution: Hunter College of CUNY

Research Mentor: Dr. Peter Serrano

Project Title: Two-Weeks of Voluntary Oral Methamphetamine Administration Produces Acute Spatial-Memory Deficit and Increases Chronic Neuroinflammatory Activity in the Hippocampus of Adolescent Male C57Bl6 Mice During Abstinence

Abstract: Methamphetamine (MA) is a highly toxic and addictive drug of abuse that affects dopaminergic, serotonergic, and even glutamatergic systems in various parts of the brain including the hippocampus. It is important that we study and understand the effect it has on the hippocampus and the production, and the ability to recover memory. Previous studies have use VOMA (voluntary oral MA administration) to administer methamphetamine to mice and by doing this it has revealed that there are memory, learning, and subsequent neurological defects. Previous studies have failed to explore the progression of neurodegeneration, damage, and cognitive deficits and the role of abstinence and its underlying molecular mechanisms that perpetuate MA-induced neurodegeneration and cognitive deficits; this study seeks to further explore these topics. We use several techniques to test, evaluate, and analyze memory, techniques such as RAM (radial 8-arm maze). In the two weeks we did our analysis we saw insufficient long-lasting cognitive deficits associated with methamphetamine abuse. Neurochemical changes in the hippocampus suggest 2-week VOMA affects inflammatory and monoamine pathways. However, we believe the changes are most likely overcome by compensatory mechanisms in order to prevent cognitive deficits in the mice.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Mia Roberts

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Psychology, 2021

Mentor at Home Institution: Dr. Nesha Star Burghardt

Scientific Interests: My research interest mainly lies in neuropsychopharmacology. I am interested in the way drugs affect one's brain and behavior. I am also interested in behavioral neuroendocrinology. Specifically, how the neuroendocrine system regulates hormonal activity in the brain and how behaviors are produced because of this regulation. In the Burghardt Lab, we are currently testing the effects of prenatal exposure to curcumin on the development of neural circuits underlying fear and anxiety. This project combines my interest in pharmacology and brain development.

Career Goals and Plan: In the future, I plan on attending graduate school to pursue and attain a Ph.D. in neuroscience. Eventually, I want to become a faculty member at a research university researching drugs, brain, and behavior. I am interested in discovering new ways to treat and better understand addictions such as opioid addiction.

ENDURE Summer Research Experience

Research Experience Institution: Vanderbilt University

Research Mentors: Dr. Heidi Hamm, Dr. Analisa Thompson Gray

Diversity Poster Session: Theme C: Neurodegenerative Disorders and Injury, M-23

Project Title: Vascular Contributions to Alzheimer's Disease

Abstract: Alzheimer's disease (AD) is the sixth leading cause of death in adults 75 years or older, with one in four people diagnosed, and the prevalence of this disease is growing. Repeated clinical trials have shown that targeting β-amyloid (Aβ) has not been successful in treating AD, thus researchers have begun to shift their focus towards the vascular aspects of the disease. Recently, it was shown that fibrin, a known factor in blood clotting, plays a key role in AD by inducing microglial-mediated inflammation. Aβ is known to prevent the breakdown of fibrin by plasmin, leading to vascular inflammation. Protease-activated receptor 4 (PAR4), when stimulated by thrombin, leads to further thrombin generation and increased fibrin production. To test the role of PAR4 in AD, we crossed PAR4 knockout (KO) mice with mice carrying 5 familial AD mutations (5XFAD) to see if these mice are protected from AD. We hypothesized that the 5XFAD x PAR4 KO mice will be protected from AD, and thrombin generation through PAR4 is necessary for fibrin deposition. Behavioral paradigms were performed to see if AD-related memory loss is decreased in the crossed animals.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Destinee B. Semidey

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Biochemistry, 2020

Mentor at Home Institution: Dr. Ekaterina Likhtik

Scientific Interests: I am interested in the underlying mechanisms of memory and learning. Specifically, I am working in the laboratory of Dr. Lihktik to identify neurons that project to the basal forebrain, an area which contains a high concentration of the neurotransmitter, acetylcholine. It is speculated that the basal forebrain plays an important role in memory and learning; however, the nature of this region in neuronal communication is still relatively unknown. My secondary interest is investigating how experiencing chronic stress may alter learning and memory pathways related to fear, and how this could potentially give rise to neuropsychiatric disorders, such as PTSD.

Career Goals and Plan: I hope to further explore my scientific interests in molecular neuroscience in the future. Currently, I am applying to graduate school to earn a Ph.D. in Neuroscience. Once I obtain a Ph.D., I plan to continue research at an academic institution to potentially become a principle investigator and a mentor for future researchers.

ENDURE Summer Research Experience

Research Experience Institution: Brown University

Research Mentors: Dr. Natalie M. D'Silva, Dr. Karla R. Kaun

Diversity Poster Session: Theme F: Integrative Physiology and Behavior, N-30

Project Title: The Effects of Alcohol Deprivation on Acute Alcohol Sensitivity in *Drosophila*

Abstract: Alcohol is a commonly abused substance that contributes to approximately 10% of global deaths. Cravings persist during periods of abstinence causing an increased likelihood of relapse due to the aversive effects of withdrawal. However, the underlying molecular mechanisms that regulate this maladaptive behavior are essentially unknown. *Drosophila melanogaster* has been an effective model for understanding the mechanistic basis of alcohol sensitivity and addiction. Utilizing this model, we investigated the correlation between alcohol abstinence and acute alcohol sensitivity. Using an enzyme-based ethanol absorbance method, we assessed how alcohol deprivation altered flies' ability to absorb alcohol following a chronic intermittent alcohol exposure paradigm. Interestingly, we found no significance between deprivation time points. This data will help us understand behavior from repeated alcohol experiences for future addiction research.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Jordy Sepulveda

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Biological Sciences, 2019

Mentor at Home Institution: Dr. Maria E. Figueiredo-Pereira

Scientific Interests: My drive is to understand the molecular mechanisms involved in aged-related neurodegenerative disorders, focusing primarily in the study of microglial cells, the resident myeloid cells in the central nervous system, and their effect on neuronal homeostasis, as well as the pathogenesis and exacerbation of neurodegenerative disorders. The significance of studying the processes carried out by microglia during neuronal degeneration is to elucidate targets to trigger a microglial response against protein aggregation pathologies, aging, and other neurodegenerative disorders.

Career Goals and Plan: Upon graduating from Hunter College, my goal is to pursue doctoral studies in the neurosciences; training and investigating the molecular mechanisms involved in microglia-neuron communication in normal and pathological central nervous system. Once I obtain my doctorate, I hope to apply my expertise in microglial biology in the academic field or the private sector.

ENDURE Summer Research Experience

Research Experience Institution: Hunter College of CUNY

Research Mentor: Dr. Maria E. Figueiredo-Pereira

Diversity Poster Session: Theme C: Neurodegenerative Disorders and Injury, M-27

Project Title: Therapeutics to Target Amyloid Beta and Tau in Fibroblasts from a Familial Alzheimer's Disease Patient: Relevance to Drug Repurposing

Abstract: In Alzheimer's Disease (AD), the Aβ42 fragment of the amyloid precursor protein (APP) and hyperphosphorylation of the microtubule associated protein Tau, play important roles in disease pathology. Drug discovery for AD has had limited success. Repurposing of FDA-approved drugs could streamline the identification of AD therapeutics. Our *in silico* studies predicted the following: (1) diazoxide (DZ), which is FDA-approved for hypertension, is a potassium channel activator that could activate multiple AD-relevant kinases; (2) the anti-inflammatory ibudilast (IBU) and the antidepressant rolipram (ROL) could inhibit AD-relevant phosphodiesterases; and (3) the cancer-preventing dibenzoylmethane (DIB) could induce the expression of antioxidant enzymes. We investigated the therapeutic potential of these four drugs against Aβ42 and Aβ40 production in skin fibroblasts from a familial AD patient carrying the A246E mutation in the presenilin 1 gene, and human neuroblastoma SY5Y cells overexpressing APP695 (APP695-SY5Y). Cell viability (MTT) assays established that DZ, DIB and ROL are not toxic, but DIB is in both fibroblast and neuroblastoma cells. Assessing Aβ42 and Aβ40 secretion with ELISAs demonstrated that DZ and IBU decrease Aβ42 production, suggesting that these drugs may reduce AD pathology, offering a new treatment strategy for this disease.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Joyce Woo

Home Institution: New York University

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Neural Science, 2020

Mentors at Home Institution: Dr. Regina M. Sullivan, Dr. Maya Opendak

Scientific Interests: I am interested in infant neurodevelopment and early life adversity and have spent much of my time investigating both human and animal development. I am currently working under Dr. Regina Sullivan at the Nathan Kline Institute and NYU, exploring the mechanisms for maternal regulation of infant fear response circuitry. Over the summer, I worked on creating an fMRI preprocessing pipeline in the Stress and Early Adversity lab at Vanderbilt, which aims to identify downstream effects of early life adversity.

Career Goals and Plan: I plan to apply to a Ph.D. program in the fall. I hope to one day be the first in my family to attain a Ph.D., and to become a principal investigator at a research-1 institution. My interests include neurodevelopment, computational neuroscience, neuroethology, and mechanisms of memory and stress.

ENDURE Summer Research Experience

Research Experience Institution: Vanderbilt University

Research Mentor: Dr. Kathryn Humphreys

Diversity Poster Session: Theme I: Techniques, P-8

Project Title: Optimizing Preprocessing Pipelines for Infant Functional MRI Data to Examine Associations Between Prenatal Stress and Infant Neurodevelopment

Abstract: Previous work established that parents and other sources of variation in the early postnatal environment can affect children's developing neurobiology. However, the impact of the prenatal environment on fetal brain structures and connectivity is less understood. In this project, we focused on examining the associations between prenatal maternal cortisol on stress-susceptible brain regions postnatally. To assess fetal exposure to maternal stress, hair samples were collected from mothers, from which cortisol concentrations will be assayed. Infant MRI data was collected during natural sleep four to six weeks after birth. Because infant neuroimaging requires special considerations during both data acquisition and analysis, adapting processing pipelines is critical for monitoring data collection and preparing input for downstream analysis. We used an existing neuroimaging processing interface, Nipype, to optimize quality control and pre-processing for infant brain data. This pipeline was used to examine the associations between stress exposure in utero on the hippocampus, amygdala, and white matter connections between the mPFC and the amygdala.

BP-ENDURE ST. LOUIS: A NEUROSCIENCE PIPELINE

WASHINGTON UNIVERSITY IN ST. LOUIS

http://endure.wustl.edu/

Principal Investigator: Erik Herzog, Ph.D. | Washington University in St. Louis

Partner Institutions: University of Missouri-St. Louis, Harris-Stowe State University

Program Description

The objective of the program is to provide rigorous and critical training in neuroscience to a diverse cohort of students from three partner institutions (Washington University, the University of Missouri-St. Louis and Harris-Stowe State University). By providing support for 10 funded positions for summer research, this proposal will establish a pipeline to graduate school. The Pipeline emphasizes sustained training in oral and written science communication, discovery science and outreach experience. Specifically, this proposal will support 10 early-stage trainees annually for up to three years each. Our Pipeline has long-standing commitments to cutting-edge research, to interdisciplinary education, and to providing modern career development.

We seek to be a program that responds to changes in the research environment by helping our students to pursue important and innovative problems and concepts, to adopt new techniques and to communicate effectively with their peers and the general public. The proposal will allow for the addition of three interactive and immersive courses that will appeal to teens and create a community of young scientists who can begin as early as the summer after their freshman year. The curriculum and research environments will remain broad and deep, combining expertise in molecular, cellular and systems-level approaches to the study of neural function and dysfunction.

Major new initiatives aimed at accomplishing these goals include: 1) the establishment of a new network of research opportunities for undergraduates interested in the neurosciences, 2) the introduction of three interactive courses (The Teen Brain, Neuroscience Futures, and Skills for a Neuroscientist) to bolster neuroscience fundamentals and a sense of community among the students, 3) enhanced involvement of the undergraduates in the Society for Neuroscience Brain Bee as part of their training in science communication, and 4) refinement of a near peer-mentoring program that has graduate students working with undergraduates and undergraduates working with high school students. These initiatives will ensure our students remain at the forefront of developments in neuroscience research, teaching and outreach.

Additional Program Team Members

Program Manager: Rochelle Smith | Washington University

Program Coordinator: Diana José-Edwards, Ph.D. | Washington University

Sonya Bahar, Ph.D. | University of Missouri-St. Louis

Robert Paul, Ph.D. | University of Missouri-St. Louis

Jana Dorfman Marcette, Ph.D. | Harris-Stowe State University

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Kia Barclay

Home Institution: Wellesley College

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Undergraduate Academic Level: College Graduate

Undergraduate Major and Graduation Date: Neuroscience, 2019

Scientific Interests: I am interested in understanding the neurological basis of substance abuse and addictive behaviors. Over the past two summers in the ENDURE program, I have specifically focused on dissecting the role of the endogenous opioid system in opioid withdrawal syndrome. I hope that my research efforts will contribute to opioid epidemic relief and provide opioid addicts with more effective therapeutics during rehabilitation.

Career Goals and Plan: I hope to pursue a Ph.D. in neuroscience in the fall of 2020. Upon graduating from a doctoral program, I will likely pursue a career in academia, as I desire to teach neuroscience at the undergraduate level.

ENDURE Summer Research Experience

Research Experience Institution: Washington University in St. Louis

Research Mentors: Dr. Ream Al-Hasani, Marwa Mikati

Diversity Poster Session: Theme G: Motivation and Emotion, N-34

Project Title: Behavioral and Neurochemical Profiles of Fentanyl Withdrawal in Mice

Abstract: Opioids are the primary treatment to relieve pain, however, their chronic use can lead to addiction. The withdrawal syndrome associated with abstinence from opioids often results in relapse, fatality, and also prevents long-term abstinence. Studies have shown that increased expression of dynorphin mRNA, the endogenous kappa opioid receptor ligand, increases during withdrawal, but the role of this peptide in vivo is still unknown. Here, we used osmotic mini-pumps to establish a fentanyl-dependent mouse model and measured both somatic and anxiety-like symptoms during withdrawal. Using a combination of microdialysis and nano-liquid chromatography/mass spectrometry we also measured changes in the endogenous peptide dynorphin during withdrawal. We found a significant increase in the bouts of foraging behavior, as well as an increase in the time spent foraging and grooming during withdrawal. Furthermore, we were able to detect novel *in vivo* opioid peptides during exposure to fentanyl. Together these findings allow us to better understand the somatic symptoms associated with fentanyl withdrawal and correlate this with real-time changes in opioid peptides.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Maya Bluitt

Home Institution: University of Kansas

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Behavioral Neuroscience, 2020

Mentor at Home Institution: Dr. Brian Ackley

Scientific Interests: My primary research interests are in the area of cognitive and systems neuroscience, specifically the neurobiological basis of neuropsychiatric disorders. My previous experiences in both cellular neurobiology and systems neuroscience has confirmed and strengthened this passion.

Career Goals and Plan: Upon my graduation next semester, I plan to pursue a Ph.D. in neuroscience to investigate the biological basis of neuropsychiatric disorders. My ultimate goal is to work as a research scientist in this field. I am especially interested in addiction and wish to investigate the neurobiological changes associated with the behavioral characteristics of the condition to gain a better understanding of and develop improved treatment for the disorder.

ENDURE Summer Research Experience

Research Experience Institution: Washington University in St. Louis

Research Mentors: Dr. Alexxai Kravitz, Dr. Bridget Matikainen-Ankney

Diversity Poster Session: Theme G: Motivation and Emotion, N-36

Project Title: Investigating Novel Aspects of Effortful Output in Mice

Abstract: Obesity is associated with many health risks and is a leading cause of death in the United States. Studies show that motivated behavior and physical activity levels are disrupted during obesity. However, animal studies investigate limited forms of motivated behavior, typically the frequency of lever presses an animal will complete for a reward. Few studies have analyzed effort, defined here as the amount of physical force exerted by an animal. We hypothesized that obese mice will exert less force to gain a reward than lean mice. To quantify effort, we designed a novel device, FORCE. Mice interacted with an active, continuous force-sensing lever to elicit a sucrose reward (1-10%). We evaluated the performance of six C57B16 adult mice to work for a reward in tasks assaying break points corresponding to effort. Our preliminary data suggests that mice display a range of effort exertion to acquire rewards. In ongoing studies, we will compare effort break points between obese and lean mice. Our goal is to use FORCE in concert with neural recordings in brain regions associated with motivation during behavioral tasks. This will allow us to analyze how distinct motivated behaviors and underlying neural circuitry are altered in obesity.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Sneha Chaturvedi

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Undergraduate Academic Level: College Graduate

Undergraduate Major and Graduation Date: Neuroscience, 2019

Mentors at Home Institution: Dr. Erik Herzog, Dr. Jeff Jones

Scientific Interests: I am interested in researching how sex impacts the neural regulation of hormones and behavior. I am also interested in how sex differences in neurobiology affect disease prevalence and treatment.

Career Goals and Plan: I plan to pursue a joint M.D./Ph.D. degree, in order to conduct translational research and connect it to my treatment of patients. I hope to complete a neuroscience Ph.D. and pursue a neuroscience-related clinical specialty.

ENDURE Summer Research Experience

Research Experience Institution: Washington University in St. Louis

Research Mentors: Dr. Erik Herzog, Dr. Jeff Jones

Diversity Poster Session: Theme F: Integrative Physiology and Behavior, N-17

Project Title: Sex Differences in Circadian Rhythmicity Arise Outside the Hypothalamus

Abstract: Most biological processes are regulated by an internal circadian rhythm, critical for synchronizing bodily functions with the outside environment. Circadian outputs differ between females and males, with mechanisms for these differences unknown. Glucocorticoids, a class of stress hormones in vertebrates, provide a model for studying sexual dimorphisms in circadian timing. Female rats show a higher mean and amplitude of corticosterone than males, with this trend most prevalent when estrogen levels are high. However, it is not known where this sex difference arises in the HPA axis. To test the hypothesis that male-female differences in daily corticosterone secretion arise within the circadian system, we dissected the paraventricular nucleus (PVN) and suprachiasmatic nucleus (SCN) from PER2:LUC male and female mice. Both the SCN and PVN showed no significant difference in amplitude, period, or phase of PER2 rhythms between males and females, even with the addition of estrogen in vitro. Our current results indicate the sex differences in glucocorticoid secretion originate further down the HPA axis.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Olumide Fagboyegun

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Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Biochemistry and Molecular Biology, 2021

Mentor at Home Institution: Dr. Eric Green

Scientific Interests: I am interested in the mechanisms of neurodegeneration and epigenetic modifications that contribute to these processes. I hope to be able to combine epigenetics research with neuroscience research, to elucidate the effects of various forms of stress on neurological disease pathogenesis. I am passionate about this topic because several neurodegenerative diseases have an "idiopathic" designation, which tells us little about the various mechanisms that precede disease pathogenesis. Epigenetic modifications may give us greater understanding of the causes of these diseases.

Career Goals and Plan: I plan to obtain an M.D./Ph.D. in order to effectively combine basic, translational, and clinical research, with the intent of fully understanding neurological disease mechanisms. One of my career goals is to become a full professor and PI of a lab at a preeminent research institution.

ENDURE Summer Research Experience

Research Experience Institution: Washington University in St. Louis

Research Mentors: Dr. John Cirrito, Dr. Carla Yuede

Diversity Poster Session: Theme C: Neurodegenerative Disorders and Injury, M-11

Project Title: GABAB Receptor Mediated Regulation of Amyloid-β Metabolism

Abstract: Extracellular amyloid-beta (Aβ) plaque deposition is a hallmark feature of Alzheimer's disease (AD). Aβ aggregation is thought to be concentration dependent, therefore, understanding mechanisms that decrease Aβ production may be key to developing AD therapies. Increased ERK activity has been found to increase activity of α-secretase, a protease which leads to nontoxic cleavage of the amyloid precursor protein (APP), lowering toxic Aβ concentration by cleaving available APP. Based on reports suggesting GABAB receptor (GABAB-R) activation increases ERK activity, we hypothesized that increased GABA signaling would decrease Aβ production in an ERK-dependent manner. Using *in vivo* microdialysis to measure Aβ levels in hippocampal interstitial fluid (ISF) of APP/PS1 mice, we found that activation of GABAB-R using its agonist (R)-baclofen lead to lower levels of ISF Aβ compared to vehicle controls. When mice were co-treated with the ERK inhibitor FR180204 and (R)-baclofen, this GABAB-R mediated decrease was unaffected. This suggests that GABAB-R mediated regulation of Aβ is ERK-independent. Nonetheless, these results provide a novel mechanism for regulation of Aβ production in a manner that is potentially significant enough for disease prevention.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Yesenia Garcia

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Neuroscience and Behavior, 2020

Mentor at Home Institution: Dr. Kellie Duncan

Scientific Interests: I am interested in investigating the cellular mechanisms by which the brain regulates hormonal activity in the body and influences social behaviors.

Career Goals and Plan: I plan to pursue a Ph.D. in neuroscience. Afterwards, I would like to contribute to and coordinate scientific research centered around the health needs of sexual and gender minorities. I hope to use my skills and experiences to reduce the disparities in transgender healthcare research while also actively working to promote and sustain diversity in STEM.

ENDURE Summer Research Experience

Research Experience Institution: Washington University in St. Louis

Research Mentors: Dr. Richard A. Slivicki, Dr. Victoria B. Bartsch, Dr. Robert W. Gereau

Diversity Poster Session: Theme G: Motivation and Emotion, O-27

Project Title: Evaluation of Somatic and Aversive Withdrawal Behaviors Following Chronic Cannabinoid Administration

Abstract: Chronic cannabis use induces dependence in a subset of users. Many cannabis users relapse after attempted cessation because of the desire to avoid unpleasant feelings, thus maintaining drug-taking behavior (Trexler et al. 2018). This negative emotional state is thought to occur via the engagement of stress-related systems, including activation of the central amygdala (Koob 2009). This study aimed to characterize somatic and aversive withdrawal behaviors following chronic cannabinoid intake. The synthetic cannabinoid agonist WIN55,212-2 (WIN) was administered repeatedly to male C57BL/6J mice followed by administration of CB_1 antagonist rimonabant to evaluate cannabinoid-type 1 (CB_1) receptor-dependent withdrawal. Somatic and aversive withdrawal behaviors were evaluated in different sets of mice. WIN-rimonabant-treatment increased paw-tremors and decreased rimonabant-evoked scratching relative to vehicle-rimonabant-treated animals, behaviors indicative of CB_1 -dependent withdrawal. Brain tissue was evaluated for c-Fos activation in the central amygdala; we observed that rimonabant increased c-Fos activation irrespective of treatment. Rimonabant did not induce conditioned place aversion in animals chronically treated with WIN, suggesting a negative aversive state may not occur with this dosing regimen. This study aids our understanding of the behavioral alterations that occur following chronic cannabinoid intake.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Julia Gorman

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Applied Mathematics and Biology, 2020

Mentor at Home Institution: Dr. Brian Fischer

Scientific Interests: I am interested in computational and systems neuroscience, with an overall goal of using information obtained about biological sensory systems for neuromorphic engineering.

Career Goals and Plan: I want to go into academia with the hopes of running a lab of my own.

ENDURE Summer Research Experience

Research Experience Institution: Washington University in St. Louis

Research Mentors: Dr. Barani Raman, Doris Ling

Diversity Poster Session: Theme D: Sensory Systems, M-35

Project Title: Decoding Primary Olfaction Circuits in Drosophila Melanogaster with Flywalk Behavioral Assay

Abstract: Olfaction is a complex sensory modality that impacts how we interact with our environment. For example, food sources are valuable, and odors associated with them are considered attractive; whereas toxins should be avoided and considered aversive. In order to gain a better understanding of how olfaction informs behavioral choices, whether an animal should consider an odor source attractive or aversive, we studied the olfactory circuits of *Drosophila Melanogaster* in a piecewise manner. We use a FlyWalk behavioral assay to quantify the behavior of *Drosophila* to understand the circuitry that assigns value to attractive and repellent odors. The FlyWalk allows us to track patterns in both position and velocity, towards or away from odorant sources. We have now been able to show the difference in behavioral responses to odors. We leverage optogenetic tools to activate specific classes of neurons on the *Drosophila* antenna to understand the individual contribution of different subcircuits to the organism-level behavior.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Sarah Hunter

Home Institution: Emory University

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Neuroscience and Behavioral Biology, 2020

Mentors at Home Institution: Dr. Brian Dias, Archana Venkatraman

Scientific Interests: I am interested in how neuronal circuits modulate behavior, as well as the genetic and environmental underpinnings that drive this modulation and contribute to individual variance.

Career Goals and Plan: I plan to continue my scientific education by pursuing graduate studies in either neuroscience or genetics. I am excited to work in both the laboratory setting and in a more translational role.

ENDURE Summer Research Experience

Research Experience Institution: Washington University in St. Louis

Research Mentors: Dr. Jordan McCall, Dr. Kyle Parker

Diversity Poster Session: Theme G: Motivation and Emotion, O-3

Project Title: Activation of Excitatory Ventral Tegmental Area Projections to the Locus Coeruleus Drives Affective Behaviors

Abstract: More than 40,000 Americans commit suicide each year. Many of these victims suffered from stress-induced major depressive disorder (MDD) and are particularly at risk as current monoamine treatments for depression do not alleviate symptoms in one-third of patients. Many patients with MDD have increased expression of N-methyl-D-aspartate (NMDA) glutamate receptors in the locus coeruleus (LC), a locus known to modulate stress-induced anxiety and resilience to chronic stress. Since previous studies have shown that blocking NMDA receptors has rapid antidepressant-like effects in humans and animal models, we investigated the neurocircuitry of traditional monoamine pathways and the role glutamate has in coordinating depressive-like phenotypes in mice. Specifically, we hypothesized that excitatory projections to the LC may modulate behaviors related to stress, depression, and anxiety. Using retrograde tracing techniques, we unveiled a prominent glutamatergic LC afferent projection and examined this newly identified projection using *in situ* hybridization, *in vivo* optogenetics, and fiber photometry. By implementing behavioral assays, including real-time place testing, elevated plus maze, and the open field test, we determined that this pathway plays a prominent role in mediating the LC's coordination of negative affective behaviors.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Michael Kanan

Home Institution: Saint Louis University

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Undergraduate Academic Level: College Graduate

Undergraduate Major and Graduation Date: Neuroscience, 2019

Scientific Interests: I am interested in the cellular and molecular basis of neurodegenerative diseases. Specifically, I am interested in understanding the relationship between the circadian clock and the pathogenesis of Parkinson's disease.

Career Goals and Plan: I plan on obtaining an M.D./Ph.D. combined degree in neuroscience in order to, one day, apply my knowledge of neuroscience and medicine to the needs of suffering patients.

ENDURE Summer Research Experience

Research Experience Institution: Washington University in St. Louis

Research Mentor: Dr. Erik Musiek

Diversity Poster Session: Theme C: Neurodegenerative Disorders and Injury, M-18

Project Title: Deletion of the Circadian Clock Gene Bmal1 Influences Alpha-Synuclein and Dopaminergic Neuron Loss *In Vivo*

Abstract: Sleep disturbances are among the most common and disabling non-motor symptoms of Parkinson's disease (PD), affecting as many as 90% of patients. Moreover, recent evidence suggests that brain aging is associated with altered expression of genes controlling normal circadian function, resulting in a disruption of regular sleep and wake cycles. However, the relationship between biological timing and the pathogenesis of PD is poorly understood. To examine the relationship between circadian dysfunction and PD, we employed CAG-Cre; Bmal1f/f mice, which have a global deletion of the core circadian clock transcription factor Bmal1. CAG-Cre; Bmal1f/f and wild type (WT) mice were aged and unilaterally injected with synthetic alpha-synuclein (α-syn) fibrils within the dorsal striatum to mimic the pathological onset of PD. We observed that the CAG-Cre; Bmal1f/f mice exhibited significant loss of dopaminergic neurons within the substantia nigra (SN) pars compacta, which is a characteristic feature of PD. α-syn fibrils were also found to cluster at lower level throughout the ipsilateral striatum, cortex, and SN of the CAG-Cre; Bmal1f/f than WT mice. The observed loss of dopaminergic neurons, and decreased spreading of α-syn spreading within the CAG-Cre; Bmal1f/f mice, suggests a potential link between the circadian clock and PD- like neurodegeneration and protein spreading. This newly found connection could potentially offer new therapeutic targets for treating PD.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Scott Lee

Home Institution: Saint Louis University

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Neuroscience, 2020

Mentor at Home Institution: Dr. Fenglian Xu

Scientific Interests: I am broadly interested in how genetic and environmental factors interact and contribute to the pathology of psychiatric disease, especially developmental disorders like autism. My current research focuses on the role of astrocyte-secreted proteins in synaptogenesis, which aims to highlight the relevance of glial cells in healthy and diseased states of the brain.

Career Goals and Plan: My ultimate goal is to become a physician-scientist in academia. After graduating from Saint Louis University, I plan on conducting full-time research before matriculating into an M.D./Ph.D. program. In the future, I want to spearhead a lab that uncovers molecular mechanisms of psychiatric disease and translate these findings into effective, evidence-based treatments in clinical settings.

ENDURE Summer Research Experience

Research Experience Institution: Washington University in St. Louis

Research Mentors: Dr. Joseph Dougherty, Sean Brophy

Diversity Poster Session: Theme B: Neural Excitability, Synapses, and Glia, L-31

Project Title: Consequences of 3'UTR Mutation on Astrocyte SPARC Expression and Localization via Immunofluorescence

Abstract: Astrocytes play a key role in regulating synapse numbers and strength throughout the central nervous system. Peripheral astrocyte processes (PAPs) flank synapses and are critical for maintaining local extracellular ion and neurotransmitter concentrations. Recent studies have suggested that active translation occurs in PAPs and that particular transcripts are locally enriched at sites of synapse interaction. One transcript of interest is the mRNA coding for SPARC, a protein secreted by astrocytes implicated in the inhibition of synaptogenesis. In this project, we visualized SPARC expression and localization via immunofluorescence in cortical astrocytes of WT mice and SPARC 3' UTR mutants. Understanding how SPARC and other astrocyte-secreted proteins localize to PAPs may ultimately help reveal their influence on synapses in both healthy and diseased states.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Denye A. Mickens

Home Institution: Washington University in St. Louis

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Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Neuroscience and Sociology, 2021

Mentors at Home Institution: Dr. Jeanne Nerbonne, Dr. Tracey Hermanstyne

Scientific Interests: I am interested in a variety of topics ranging from cellular excitability and cardiovascular health to maternal and fetal wellness.

Career Goals and Plan: After graduating from Washington University, I would like to take two gap years to conduct research in a public health related field. I will then continue my education to become a physician scientist.

ENDURE Summer Research Experience

Research Experience Institution: Washington University in St. Louis

Research Mentors: Dr. Jeanne Nerbonne, Dr. Tracey Hermanstyne

Diversity Poster Session: Theme B: Neural Excitability, Synapses, and Glia, L-36

Project Title: Intracellular Fibroblast Growth Factors and the Modulation of Cardiac Kv Channels

Abstract: Proper cardiac function and the generation and repolarization of cardiac action potentials are dependent on the movement of ions such as sodium and potassium through specialized ion channels. These channels are thought to function in macromolecular protein complexes that comprise pore-forming alpha subunits and several accessory proteins, such as the intracellular fibroblast growth factors 11-14 (iFGF11-14). To date, the iFGFs are mostly known for their ability to modulate voltage-gated sodium channels, and a mutation in FGF12 has been linked to a life-threatening ventricular arrhythmia known as Brugada syndrome. More recent studies, however, have indicated that iFGF13 is also capable of regulating cardiac potassium currents, as loss of Fgf13 in mice results in a decrease in the density of the rapidly activating and inactivating transient outward current, Ito,f, in ventricular myocytes. RNA Sequencing and qPCR analysis, however, revealed that only FGF12 is expressed in the human heart. We, therefore, designed electrophysiological experiments to test whether iFGF12 and iFGF13 have the same physiological effect on cardiac potassium currents. Using an Fgf12 knockout mouse model and electrophysiological techniques, we found that loss of Fgf12 has no significant effect on the densities or biophysical properties of the potassium currents in the cardiac ventricle.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Maria Rivera-Santana

Home Institution: University of Puerto Rico-Mayaguez

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Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Biology, 2021

Scientific Interests: My interests focus on the areas of cognitive and clinical neuroscience. I am interested in research on neurodegeneration and other health conditions that affect the brain's normal functioning. Contributions I would like to make to the field include the identification of relevant biomarkers of neurodegeneration present in different diseases, identification of novel treatments to halt disease progression, and identification of biological predictors of disease onset. I am also interested in fields that study complex processes such as sleep, memory, and learning, and how they change with disease.

Career Goals and Plan: Being exposed to both intensive research in neuroscience and experiences in clinical settings has affirmed my interest to be an M.D./Ph.D. I recognize that research in neuroscience is complementary to the study of medicine and having a dual preparation in these will enable me to be a more competent researcher and physician. Instruction as a physician-scientist will qualify me to generate a small-scale impact in a clinical setting and a large-scale impact doing research. Meeting M.D./Ph.D. professionals and learning how their research complements their patient care has inspired me even further to pursue this career.

ENDURE Summer Research Experience

Research Experience Institution: Washington University in St. Louis

Research Mentor: Dr. Tamara Hershey

Diversity Poster Session: Theme C: Neurodegenerative Disorders and Injury, M-22

Project Title: Atrophy Across Thalamic Nuclei in Wolfram Syndrome

Abstract: Wolfram syndrome (WFS) is a neurodegenerative disease partially characterized by deficits in visual acuity, hearing, and motor coordination. These functions are related to the posterior thalamus, which is suspected to significantly deteriorate over time in WFS. Therefore, it is plausible that atrophy in this region is responsible for the severity of some WFS symptoms. Thalamic nuclei atrophy and symptom severity have not been studied previously for WFS. MRI scans from WFS and control subjects were segmented using Freesurfer 6.0 to obtain thalamic volumetric data. Nuclei were grouped by positional and functional regions of interest, and longitudinal volumetric changes were studied along with their relationship to clinical data. Results indicate that posterior and non-posterior thalamic regions atrophied greatly over time in the disease, but the posterior region deteriorated at a greater rate. Further analyses on clinical correlates could elucidate a relationship between atrophy in the posterior region and loss of balance over time. Motor and vision nuclei were also found to atrophy significantly in WFS. These findings suggest that posterior thalamic volume may be a reliable biomarker of neurodegeneration in WFS.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Luis Ruiz

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Biomedical Engineering, 2020

Scientific Interests: I am interested in the development, characterization, and application of neural interfaces geared towards motor and sensory restoration.

Career Goals and Plan: After attaining my undergraduate degree, I hope to enter a biomedical engineering doctoral program with an emphasis on neural engineering. Thereafter, I hope to complete a post-doctoral program, and eventually open my own lab and continue to be an active member of the scientific research community.

ENDURE Summer Research Experience

Research Experience Institution: Washington University in St. Louis

Research Mentors: Dr. Matthew MacEwan, Nathan Birenbaum

Diversity Poster Session: Theme D: Sensory Systems, M-43

Project Title: Behaviorally Characterizing Sensory Percepts from Macrosieve Stimulation in a Rat Model

Abstract: Over two million Americans today have lost a limb due to a wide range of injuries including diabetes, trauma, and cancer. Current prosthetic technology cannot replicate the sensory feedback afforded by the body's natural pathways, and in absence of such feedback, use of these prosthetics becomes a cognitive burden for the user. Truncated peripheral nerves retain the ability to transmit sensory signals to the brain. Thus, prosthetics interfaced with the peripheral nervous system via implanted electrodes could close the feedback loop and enable intuitive control of these devices. The macrosieve electrode (MSE), developed at Washington University, is currently being studied at the Ray/MacEwan Lab for this application. Here, we utilize a rat sciatic model and a novel behavioral assay to characterize the sensory capabilities of the MSE, namely by establishing the interface's sensory threshold. Operant conditioning was used to implement the behavioral task, and psychophysical principles underlined data analysis. Results of this study will quantify the MSE's suitability in sensory restoration applications and contribute to a growing body of research advocating for its adoption in motorized prostheses applications.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Rossana Sandoval

Home Institution: Saint Louis University

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Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Neuroscience, 2021

Scientific Interests: I am very interested in the role of memory in contextual drug usage and dependence, as well as the role of chronic pain in affective behaviors mediated by endogenous opioid peptides. I also have a general interest in the link between cannabinoid and opioid systems as they relate to relapse and withdrawal.

Career Goals and Plan: My ultimate career goals are still uncertain, but I'm interested in going to graduate school to continue researching how opioid/cannabinoids, pain, and addiction interact, with the purpose of finding therapeutic targets to treat chronic pain and addiction.

ENDURE Summer Research Experience

Research Experience Institution: Washington University in St. Louis

Research Mentors: Dr. Sidney Williams, Dr. Nicolas Massaly

Diversity Poster Session: Theme G: Motivation and Emotion, O-19

Project Title: Assessing the Role of Dorsal Hippocampal Circuits in Reinforcement and Expression of Opioid-Induced Contextual Memory

Abstract: The formation and maintenance of drug-paired contextual memory precipitates craving and relapse to opioid misuse following re-exposure to contexts in which the drug has been routinely taken, even after long periods of abstinence. Previous studies have demonstrated that the CA1 region of the dorsal hippocampus (dCA1) is involved in morphine-induced contextual memory formation and retrieval, but it remains unknown if the dCA1 is necessary and sufficient in the formation and expression of reward-paired contextual memories. We hypothesized that the dCA1 is necessary for the expression of opioid-context memory and stimulation of the dCA1 is sufficient to trigger real-time and context-dependent reward-seeking behavior. To determine the necessity of the dCA1 during cue-induced drug-paired memory retrieval, we chemogenetically silenced the dorsal hippocampus following morphine conditioned place preference. Our preliminary findings show that silencing the dCA1 may attenuate the retrieval of morphine context-dependent memories. Optogenetic activation was utilized to stimulate the dorsal hippocampus of mice via excitatory opsins during cued and un-cued real-time place conditioning. Our results show that direct stimulation of the dCA1 is sufficient to drive a behavioral preference for the stimulation-paired compartment in real-time but unable to drive lasting memory formation, uncovering the possible role of the dCA1 in the reinforcement of reward-paired contexts. Together, our findings illuminate the role of the dorsal hippocampus in the formation of reward-associated memories.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Vanessa Serrano

Home Institution: San Diego State University

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Psychology and Communications, 2020

Scientific Interests: I am interested in biopsychosocial determinants of physical and cognitive health outcomes among chronically ill and high-risk populations from young adulthood onward. I have studied HIV infection but am also interested in other chronic diseases. Considering that health is multi-dimensional, I aim to blend behavioral medicine and neuropsychology, with an emphasis on health disparities.

Career Goals and Plan: I am currently applying to Ph.D. programs in clinical psychology, with an emphasis in neuropsychology, for entry in the fall of 2020. I want to continue examining health disparities and the intersection between behavioral medicine and neuropsychology among chronically ill populations. In the future, I hope to continue this line of research in a medical center and complement my research as a practicing neuropsychologist serving ethnically diverse and underrepresented populations at risk for adverse cognitive outcomes (i.e. poor, frail, economically disadvantaged, homeless).

ENDURE Summer Research Experience

Research Experience Institution: University of California San Diego

Research Mentors: Dr. David Moore, Dr. Jessica Montoya, Dr. Robert Heaton

Diversity Poster Session: Theme H: Cognition, O-43

Project Title: The Relationship Between Vascular Endothelial Growth Factor (VEGF) and Amnestic Mild Cognitive Impairment Among Older Adults Living with HIV

Abstract: Older people living with HIV (PLWH) are particularly susceptible to age-related neurodegenerative diseases, such as Alzheimer's disease (AD). Low levels of vascular endothelial growth factor (VEGF) have been associated with AD-related neurodegeneration. It is unknown whether VEGF is also associated with the precursor stage to AD dementia, amnestic mild cognitive impairment (aMCI). We compared levels of plasma-based biomarkers of the VEGF family by aMCI status among PLWH and hypothesized lower levels of these biomarkers among the aMCI+ group. Participants (n = 67; all PLWH) completed neurobehavioral and neuromedical evaluations. Plasma biomarkers within the VEGF family were measured by immunoassay. Jak/Bondi criteria was used to classify aMCI status. Logistic regression models were conducted to determine whether levels of VEGF family biomarkers were associated with aMCI status. Demographic variables, comorbidities, and HIV disease characteristics associated with levels of the VEGF family biomarkers at $p<0.10$ were included as covariates. Eighteen PLWH met criteria for aMCI. Lower levels of VEGF-D (OR = 60.4, $p < .01$) and antidepressant use (OR = 4.3, $p < .02$) were associated with higher odds of meeting classification for aMCI (model $p = .002$). Low expression of VEGF-D may be a mechanism of aMCI in the context of HIV.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Samanda Valente

Home Institution: Carnegie Mellon University

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Neuroscience, 2020

Scientific Interests: My research interests lie in understanding the molecular basis of disease, whether it be in neurodevelopment or neurodegeneration.

Career Goals and Plan: I plan to continue my preparation in neuroscience by participating in research for two years or so, after I finish my undergraduate degree. Then, I plan to pursue a joint M.D./Ph.D. in order to gain the skills to further bridge the gap between understanding the brain and disease.

ENDURE Summer Research Experience

Research Experience Institution: Washington University in St. Louis

Research Mentors: Dr. Harrison Gabel, Sabin Nettles

Diversity Poster Session: Theme A: Development, L-20

Project Title: Functional Effects of Topoisomerase IIB Mutation in Neurodevelopmental Disease

Abstract: Mutations in gene regulatory proteins can be a major underlying cause of intellectual disability and neurodevelopmental disorders. However, the mechanism by which disruption of these proteins can lead to diseases is poorly understood. One such gene regulatory protein is Topoisomerase 2 Beta (Top2B), which resolves supercoils during transcription and cell division and thus is important for expression of genes that are essential for normal neuronal development and synapse formation. A recent exome sequencing study identified a His58Tyr mutation in Top2B in a patient exhibiting severe developmental delay and learning disabilities, suggesting that disruption of Top2B drives neuronal dysfunction in disease. However, the functional effects of this mutation have not yet been characterized. Here we carried out *in vitro* studies to examine the effects of the His51Tyr mutation on Top2B function. We found that there is no change in the expression of Top2B His51Tyr in cells, but we detected increased enzymatic activity for this mutant. Based on the normal enzymatic role Top2B plays in creating double stranded breaks in DNA, we are assessing functional effects of the mutation on cell health by measuring levels of DNA damage in dividing cells expressing the mutant Top2B protein. Additionally, since Top2B is required for expression of genes important for neuronal function, we will measure downregulation of these genes in neurons.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Sierra Williams-Mcleod

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Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Biochemistry, 2021

Mentors at Home Institution: Dr. Michelle Waddell, Dr. Andrij Horodysky

Scientific Interests: I am interested in neurodegeneration, specifically through targeting different genes that give rise to neuroinflammation.

Career Goals and Plan: I plan to obtain a Ph.D. in either neuroscience or neurobiology. I aspire to complete a postdoctoral program and work in industry at a neuropharmaceutical company. Later in my career I plan to teach at a university.

ENDURE Summer Research Experience

Research Experience Institution: Washington University in St. Louis

Research Mentors: Dr. Gilbert Gallardo, Carolyn Mann

Diversity Poster Session: Theme C: Neurodegenerative Disorders and Injury, M-32

Project Title: Investigating the Role of α2-Na/K ATPase in the Neurotoxicresponse of ApoE4-Expressing Astrocytes

Abstract: Alzheimer's disease (AD) is an irreversible neurodegenerative disease that affects 44 million people worldwide. AD is characterized by multiple changes in the brain, including senile plaques made of amyloid-beta peptide (AB) and the accumulation of tau protein. Recently, neuroinflammation, a third key factor of AD, has sparked attention following genomic association studies that identified various loci harboring genetic variants that influenced the inflammatory pathways of AD. While researchers have gained a better understanding of the role of microglia in AD, astrocytes, the predominant inflammatory cells in AD, and how they change through degeneration are still not well-known. However, ApoE, an apolipoprotein E gene that is primarily expressed in astrocytes, has been shown to accelerate the onset of AD and dementia. In previous studies, Apo astrocytes demonstrated an exacerbated inflammatory response that potentially drives neurodegeneration in AD. This research aimed at understanding the molecular mechanism by which ApoE4 expressing astrocytes exhibit a neuroprotective response by knocking down the astrocytic Na+/K+ ATPase (α2-NKA). This research shows the ability of short-hairpin RNA targeting the α2-NKA in preventing astrocytic-dependent neurotoxicity and will identify some neurotoxic factors that are relevant to inflammation and degeneration.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Hunter Yamada

Home Institution: Brown University

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Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Neuroscience, 2021

Mentor at Home Institution: Dr. Monica Linden

Scientific Interests: My interest in neuroscience began after my grandfather went through brain surgery for a subdural hematoma when I was ten. My interactions with him not only made me realize the life-saving aspect of clinical neuroscience, but also inspired many inquiries that could only be answered through research. These questions morphed into a wider interest in nervous system degradation and repair. Conducting research related to spinal cord repair in this past summer strengthened my interest in developing methods for repairing damaged neural tissues.

Career Goals and Plan: My ultimate career goal is to be able to pursue both professional research and neurosurgery. The mixture of research and clinical expertise would allow me to combine the two fields to further my scientific goals. Practicing as a neurosurgeon would give me a clinical perspective of aging brains on a macro scale, while research would allow me to investigate the microscopic details. I could also utilize a surgeon-researcher position to develop new methods in medicine. I believe that the two pursuits are more effective when working together.

ENDURE Summer Research Experience

Research Experience Institution: Washington University in St. Louis

Research Mentors: Dr. Mayssa Mokalled, Dr. Diana Jose-Edwards, Dr. Eric Herzog, Dr. Lili Zhou

Diversity Poster Session: Theme B: Neural Excitability, Synapses, and Glia, L-45

Project Title: Exploring Glial Bridging Factors Involved in Spinal Cord Repair

Abstract: In cases of mammalian spinal cord injury, glial scars form and create a physical barrier against regeneration. In stark contrast with the lack of spinal cord regenerative abilities in humans, zebrafish are capable of efficient and spontaneous spinal cord repair. Following complete spinal cord transection in zebrafish, specialized glial cells form a scaffold-like glial bridge that connects the severed cord and supports axon regrowth. Here, we performed a genome-wide screen for genes enriched in the glial bridge after spinal cord injury in zebrafish. Riboprobes were generated for highly upregulated genes and in-situ hybridization was performed to confirm their expression in the glial bridge following injury. Following this expression screen, genes that show expression in the glial bridge will be further explored by a CRISPR-Cas9 mutagenesis screen to assess their necessity during glial bridging and spinal cord regeneration.

BRAiN: BUILDING RESEARCH ACHIEVEMENT IN NEUROSCIENCE

UNIVERSITY OF COLORADO DENVER ANSCHUTZ MEDICAL CAMPUS

http://www.ucdenver.edu/academics/colleges/medicalschool/programs/Neuroscience/Program/Pages/brain.aspx

Principal Investigator: Diego Restrepo, Ph.D. | University of Colorado Denver

Principal Investigator: Barbara Lyons, Ph.D. | New Mexico State University

Principal Investigator: Sondra Bland, Ph.D. | University of Colorado Denver Downtown Campus

Partner Institution: New Mexico State University

Program Description

Student training through institutional partnerships will bridge the neuroscience research participation gap by preparing diverse undergraduates in the Rocky Mountain and Southwest Region for successful entry to neuroscience Ph.D. programs.

BRAiN unites preexisting formal research and education programs at diverse institutions: the Neuroscience Graduate Program at the University of Colorado Denver in the Anschutz Medical Campus (NSP at UCD-AMC), home to a T32 Neuroscience Training Grant; the RISE to Excellence biomedical research education program at New Mexico State University (NMSU), a Hispanic serving minority institution; and the undergraduate Brain and Behavior program of the Department of Psychology at the University of Colorado Denver downtown campus (UCD-DT). BRAiN aspires to expand through developmental partnerships with Colorado State University- Pueblo and other colleges in the region.

Broad participation in the Ph.D. neuroscience/behavior pipeline will be enabled through pursuit of three specific aims: (1) recruitment of 67 BRAiN Scholars from diverse demographic groups that are nationally underrepresented in biomedical and behavioral neuroscience research; (2) development of the neuroscience/behavior research expertise and professional skills of BRAiN Scholars; (3) retention of BRAiN Scholars in neuroscience/behavior research through enrollment in postgraduate programs.

BRAiN will provide intensive training that combines mentored independent research with student development of a rich knowledge base in neuroscience core concepts. Curriculum integration will be achieved through a common Neuroscience Seminar Series and a Neuroscience Core Course. Emphasis will be placed on enhancement of mentorship skills through activities such as the Neuroscience Mentor Academy where faculty will meet to discuss student training, program evaluation, and curriculum reform. Taken together, the proposed activities will provide an integrated research and professional development experience across multiple sites that leverages 21st century resources for scientific investigation and is responsive to practical aspects of contemporary student life.

Additional Program Team Members

Research Education Facilitator: Isaac del Rio | New Mexico State University

Elba Serrano, Ph.D. | New Mexico State University

Ernesto Salcedo, Ph.D. | University of Colorado Denver Anschutz Medical Campus

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Aprilina Araiza

Home Institution: New Mexico State University

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Biochemistry, 2020

Mentors at Home Institution: Dr. Jeffrey Arterburn, Dr. Ramesh Chinnasamy

Scientific Interests: Since I joined the BRAiN program, I have been exposed to and participated in research labs focusing on neurodegenerative diseases and since then my interest in the brain has grown. More specifically I have enjoyed learning about how neurons are involved in the pathology of Alzheimer's disease.

Career Goals and Plan: After I graduate with my bachelor's degree in biochemistry, I plan to apply to graduate school and to pursue a Ph.D. in neuroscience. I would really enjoy working in a lab that focuses on Alzheimer's disease, but I am also willing to work in other branches of neuroscience to broaden and expand my knowledge of the brain.

ENDURE Summer Research Experience

Research Experience Institution: University of Colorado Anschutz Medical Campus

Research Mentors: Dr. Huntington Potter, Esteban Lucero

Diversity Poster Session: Theme C: Neurodegenerative Disorders and Injury, L-46

Project Title: Investigating Kinesin-5 Overexpression in Hippocampal Long-Term Potentiation

Abstract: Kinesin-5 is a homotetrameric motor protein that crosslinks antiparallel microtubules and slides them in the plus end direction. The best-known function of Kinesin-5 is its role in assisting spindle formation and separating the chromosomes during mitosis. In neurons it's important for microtubule stabilization, neurite outgrowth and dendritic spine density. Previous studies have shown that the inhibition of Kinesin-5 mimics phenotypes associated with amyloid beta (Aβ) toxicity and Alzheimer's disease (AD), such as a decrease in spine density and an increase in aneuploidy. Based on these studies the goal of this project is to determine whether Kinesin-5 is an effective target for maintenance of cognitive function often lost in neurodegenerative diseases such as Alzheimer's disease. Here we asked whether Kinesin-5 overexpression impacts long-term potentiation (LTP) in aged mice. We performed LTP measurements in aged wild type and Kinesin-5 overexpressing mice. Our data indicate that at younger ages, Kinesin-5 overexpression does not impact LTP, but might protect against aged related decreases of LTP in older mice. These findings might suggest that Kinesin-5 activity is important for learning and memory and maintenance of Kinesin-5 activity during AD could serve as a therapeutic option.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Lorena Casiano

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Genetics and Biotechnology, 2021

Mentor at Home Institution: Dr. Elba E. Serrano

Scientific Interests: I am heavily interested in neuroscience research because my brother has two neurological disorders, autism spectrum disorder and epilepsy. Being personally affected has motivated my current scientific and career goals to help improve the lives of individuals affected by neurological disorders. I have interests in other neurological disorders, such as Parkinson's disease, Alzheimer's disease, glioblastoma, and Huntington's disease, to name a few.

Career Goals and Plan: I plan to graduate in May 2021 with a bachelor's degree in genetics and biotechnology and a minor in biology. I intend to apply to neuroscience Ph.D. graduate programs, such as neurobiology, neurological behavior, and psychological neuroscience. After I earn my graduate degree and find a job, I want to work my way up and run my own laboratory to conduct research in the field of neurological disorders, focusing specifically on autism and epilepsy.

ENDURE Summer Research Experience

Research Experience Institution: University of Colorado Anschutz Medical Campus

Research Mentors: Dr. Wenbo Zhou, Stephanie M. Garcia, and Dr. Curt R. Freed

Diversity Poster Session: Theme C: Neurodegenerative Disorders and Injury, M-6

Project Title: Assessing HDACi Drug Phenylbutyrate's Clinical Translational Potential

Abstract: Parkinson's disease (PD) is a neurodegenerative disease characterized by motor and non-motor deficits. Pathological hallmarks of PD include alpha-synuclein protein aggregation in neurons, known as Lewy bodies, and neurodegeneration of dopamine neurons. The calcium channel blocker drug isradipine promotes neuroprotection in cell culture and rodent models of PD but failed to show effectiveness in a Phase 3 double-blind placebo-controlled clinical trial. Previous work in Dr. Curt R. Freed's lab has shown that sodium phenylbutyrate protects dopamine neurons from neurotoxicity induced by oxidative stress or alpha-synuclein aggregations in both cell culture and transgenic mouse models. Phase I clinical trials demonstrated that oral doses of glycerol phenylbutyrate was well received by PD patients. The goal of this project is to prevent the same fate of isradipine for the drug sodium phenylbutyrate by further testing the two drugs against our dopaminergic cell lines and animal models to differentiate the two. Using three variations of rat dopaminergic cell lines, the drugs were tested against cells that underwent oxidative stress chemically induced by hydrogen peroxide. Cell viability was measured, and the results showed that isradipine could block the negative effects of oxidative stress on all three cell lines and outperformed sodium phenylbutyrate.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Lauren Keener

Home Institution: New Mexico State University

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Psychology, 2019

Mentors at Home Institution: Dr. Barbra Lyons, Dr. Jim Kroger

Scientific Interests: Currently, I am interested in both molecular and cellular neuroscience, as well as neurogenetics. I have found a particular interest in the way that genes and proteins can affect how neurons function especially in the developing brain.

Career Goals and Plan: After graduating this fall, I will be attending a post-baccalaureate pre-medical program to continue gaining experience in the field of neuroscience research and to further prepare myself for attending medical school to obtain an M.D./Ph.D. in pediatric neurology and neuroscience.

ENDURE Summer Research Experience

Research Experience Institution: University of Colorado Anschutz Medical Campus

Research Mentors: Dr. Time Benke, Dr. Ernesto Salcedo

Diversity Poster Session: Theme B: Neural Excitability, Synapses, and Glia, L-28

Project Title: Localization of CDKL5 to Excitatory and Inhibitory Synapses

Abstract: Pathological mutations in cyclin-dependent kinase-like 5 (*CDKL5*) cause CDKL5 deficiency disorder (CDD, OMIM 300203, 300672), a developmental encephalopathy (DE) associated with severe early-life epilepsy, motor, cognitive, visual and autonomic disturbances. These disorders are considered developmental because hallmarks, such as epilepsy, may appear or disappear with developmental progression. Pathological mutations in *CDKL5* are now recognized as a relatively common genetic cause of early-life epilepsy. CDKL5 is a binding partner of both PSD-95 and gephyrin. Studies have typically found that loss of CDKL5 leads to a global reduction in excitatory synapse numbers with loss of GluA2 and increased GluN2B. Inhibitory synapses appear to be unaffected. This does not fully explain the presumed excitation/inhibition imbalance in epilepsy. In order to address this gap, we used cultured rat hippocampal pyramidal neurons (post-natal day 0-1) and immunocytochemistry. Antibodies against GABRG2 (a marker for inhibitory synapses), PSD-95 (a marker for excitatory synapses), and CDKL5 were used to identify excitatory and inhibitory synaptic clusters with CDKL5 to address co-localization. We found that co-clusters of PSD95, GABRG2, and CDKL5 were not apparent on the dendrites of rat hippocampal pyramidal neurons. CDKL5 co-clustered independently with PSD95 or GABRG2. Future experiments will explore different developmental ages.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Andrew Parra

Home Institution: New Mexico State University

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Biochemistry, 2020

Mentor at Home Institution: Dr. Paola Mera

Scientific Interests: My interest has been in the molecular approach to understanding proteins. I enjoy molecular techniques and want to employ them in a neuroscience model. Developmental neuroscience with molecular neuropharmacology has me quite fascinated, although I am also interested in bacterial/cancer resistance.

Career Goals and Plan: In the coming year following graduation, I plan to apply to a M.D./Ph.D. program that will teach me techniques I can apply in a clinical setting. I want to work with people who have genetic diseases to further define underlying mechanisms and treat a patient effectively.

ENDURE Summer Research Experience

Research Experience Institution: University of Colorado Anschutz Medical Campus

Research Mentors: Dr. Diego Restrepo, Daniel Ramirez-Gordillo

Diversity Poster Session: Theme H: Cognition, O-41

Project Title: Decreased Expression of CaMKIIα in the Mouse Brain Delays the Ability to Learn in an Olfactory Odor Go-No-Go Task

Abstract: The neuropsychiatric disease schizophrenia has been shown to impair memory and cognitive abilities. The alpha-isoform calcium/calmodulin-dependent protein kinase II (CaMKIIα) has been shown to modulate long-term potentiation and long-term depression, two essential processes for learning and memory. Heterozygous CaMKIIα knockout (KO) mice display a schizophrenic-like phenotype which includes impaired working memory, hyperactivity, and an immature dentate gyrus. To elucidate the function of CaMKIIα an olfactory odor discrimination task was used to assess cognitive learning deficits. Electrical activity in the CA1 region of the hippocampus and medial prefrontal cortex was measured using double tetrode implants. All mice learned to differentiate between dissimilar odors. However, when a similar odorant pair was reversed in order, CaMKIIα KO mice took longer to learn the task. Furthermore, local field potential measurements indicated a difference in the oscillation power between the CaMKIIα KO and wild type mice. These observations suggest a key role of CAMKIIα in associative odorant learning.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Jose Riguero

Home Institution: University of Colorado Denver

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Psychology, 2020

Mentors at Home Institution: Dr. Diego Restrepo, Connor McCullough

Scientific Interests: I am invested in studying schizophrenia and the many symptoms that are produced by the illness. Specifically, though, I am interested in examining the mechanisms behind tardive dyskinesia, an effect produced by many first-generation antipsychotics that causes the consumer of the medication to have uncontrollable facial muscular spasms.

Career Goals and Plan: I intend to pursue a bachelor's degree in psychology with a minor in chemistry and then pursue graduate school for a Ph.D. in neuroscience.

ENDURE Summer Research Experience

Research Experience Institution: University of Colorado Anschutz Medical Campus

Research Mentors: Dr. Diego Restrepo, Dr. Emily Gibson

Diversity Poster Session: Theme I: Techniques, P-5

Project Title: Imaging Odor Associated Activity in the Basolateral Amygdala Using Implanted Gradient Index Lenses

Abstract: Gradient index refractory (GRIN) lenses were inserted above the basolateral amygdala (BLA) in mice to view calcium ion channel activity during a go-no-go odor discrimination task on an olfactometer. GRIN lenses have a radially dependent index of refraction, allowing the lens to have little to no aberration present. The BLA is critical to the fear and stress response of the mouse and receives olfactory inputs from the lateral entorhinal cortex. Thus, it is probable that the basolateral amygdala displays some activity when discriminating between odors and deprived of water. Currently, several animals have received the implantation in the BLA, and baseline imaging is being conducted to detect viral expression before properly commencing the go-no-go task.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Yvonne Weissbarth

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Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Biomedical Sciences, 2020

Mentor at Home Institution: Dr. Bruce Appel

Scientific Interests: My interests encompass neurodevelopment and RNA localization by oligodendrocytes in both healthy and disease model states. Also, the development and function of myelin in the central nervous system, the signaling pathways, and the communication between neurons and glial cells.

Career Goals and Plan: After completing my bachelor's degree in biomedical sciences, I plan to pursue a Ph.D. in neuroscience with a concentration in neurodevelopment and glial cells. I would like to peruse a career in academic medical research.

ENDURE Summer Research Experience

Research Experience Institution: University of Colorado Anschutz Medical Campus

Research Mentor: Dr. Bruce Appel

Diversity Poster Session: Theme B: Neural Excitability, Synapses, and Glia, L-43

Project Title: Transport and Localization of RNA, by FMRP is Required for Proper Developmental Myelination by Oligodendrocytes

Abstract: Fragile X is the leading heritable cause of autism spectrum disorder, with patients exhibiting both neurological and myelin deficits. These deficits ultimately result in intellectual and developmental disabilities. Fragile X is caused by a mutation in FMR1 and results in loss of expression in RNA binding protein, FMRP (Fragile X mental retardation protein). Although historically Fragile X has been studied as a neurodegenerative disease, myelin deficiencies implicate oligodendrocytes in facilitating myelin development. Because myelin is critical for neuronal activity, plasticity and proper cognition; any abnormalities in normal development of myelin may lead to disruptions in learning and memory characteristic of Fragile X syndrome. Examining the components of RNA binding protein *in vivo* within the central nervous system by FMRP using zebrafish models will further illustrate how FMRP facilitates myelin growth by transporting and locally translating RNAs within myelin sheaths.

BRIDGE TO PH.D. IN NEUROSCIENCES PROGRAM

MICHIGAN STATE UNIVERSITY

http://bpnp.msu.edu/

Principal Investigator: William Atchison, Ph.D. | Michigan State University

Co-Investigator: Brian Mavis, Ph.D.| Michigan State University

Partner Institutions: St. Mary's University, Northern New Mexico College, University of Puerto Rico-Arecibo, University of Puerto Rico-Cayey

Program Description

The goal of "Bridge to Ph.D. in Neurosciences Program" is to increase the number of underrepresented minority (URM) Ph.D.s trained in neurosciences: specifically, to facilitate their entry into high quality and highly competitive mainland Ph.D. or dual degree) programs with a neuroscience emphasis and enhance their likeliness of their success in the program. Central to this is the need to 1) identify talented students with potential for Ph.D. studies in neuroscience; 2) introduce them to career opportunities in neuroscience; 3) provide research training and individual mentoring; 4) increase their competitiveness for graduate study; and 5) provide additional professional development activities. It entails established partnerships between MSU and 4 minority serving institutions (MSIs): two campuses in Puerto Rico in the University of Puerto Rico (UPR) system (UPR-Cayey and UPR-Arecibo), as well as two MSIs in the Southwest (Northern New Mexico College and St. Mary's University).

To introduce students to neuroscience, a day-long workshop entitled, "What is Neuroscience?" will be held annually on each of the partnering campuses. To sustain student interest in neuroscience, a two-semester videoconference journal club will be held at MSU and broadcast live to the 4 MSIs. Six URM students annually from the four MSIs will spend the fall semester between their 3rd and 5th years at MSU taking 9 credits of classwork and continuing on an original, hypothesis-based research project. Included will be a seminar-type course stressing translational and interdisciplinary approaches to understanding the etiology of human disease. This course will entail significant practice in writing, as well as an integral journal club. Improvement of communication skills will involve both informal and more formalized settings (research presentations, participation in class, journal club participation and paper writing).

This program will increase the number of URM students entering Ph.D. programs in neuro-/behavioral science, by 1) increasing the student's awareness for research career opportunities in neuroscience, 2) improving their English language skills, 3) providing high quality mentored research experience during the undergraduate studies to 'springboard" the student into the Ph.D. program, and 4) providing further didactic training in neuroscience principles, scientific writing, and career enrichment activities. Through these combined activities, the student will become more confident in the application process, present a more competitive application and make valuable contacts (network) with researchers at MSU and elsewhere.

Additional Program Team Members

Program Coordinator: Melissa Jaiman-Cruz | Michigan State University

Robert Ross, Ph.D. | University of Puerto Rico-Cayey

Hirohito Torres, Ph.D. | University of Puerto Rico-Arecibo

Ulises M. Ricoy, Ph.D. | Northern New Mexico College

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Ashley Burgos Sanchez

Home Institution: Universidad Ana G. Mendez

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Cellular-Molecular Biology, 2020

Scientific Interests: My research interest during last summer was based on a neurological approach focused on pharmacological and toxicological effects.

Career Goals and Plan: I am a senior student; my future plans are focused on continuing my graduate studies in pharmacy school.

ENDURE Summer Research Experience

Research Experience Institution: Michigan State University

Research Mentor: Dr. William D. Atchison

Diversity Poster Session: Theme B: Neural Excitability, Synapses, and Glia, L-41

Project Title: Assessment of the Effect of Acute Methylmercury (MeHg) Exposure on the Expression of GABAA Receptors in the CNS of ALS Mouse Model

Abstract: The gamma-amino butyric acid A receptor (GABAAR) mediates fast inhibitory synaptic transmission in the adult mammalian brain. The agonist of GABAAR is the gamma-amino butyric acid (GABA), the primary inhibitory transmitter that plays a crucial role in controlling neuronal excitability. However, whether activation of GABAARs induces excitation of inhibition mainly depends on the intracellular chloride concentration [Cl-]. Previous studies from our lab suggest that the GABAAR is a sensitive target to MeHg. Also, changes in GABAAR function have been implicated to be involved in the pathophysiology of amyotrophic lateral sclerosis (ALS). Most importantly, we previously showed that chronic MeHg exposure accelerates the onset of ALS phenotype. Here we hypothesize that MeHg may alter the expression pattern of GABAAR subunit. Therefore, the purpose of this research is to explore the potential effects of MeHg on the expression pattern of GABAA receptors subunits, in the cortex, brainstem, spinal cord and cerebellum. Following in vitro exposure of brain slices from different regions of the mouse brain in order to analyze changes in the expression of a subset of GABAAR subunits using real-time PCR, the results suggested that acute exposure to MeHg induces differential GABAA expression receptor subunit in the ALS mouse model.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Ariana del Mar Miller-Maldonado

Home Institution: University of Puerto Rico-Cayey

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Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Chemistry, 2022

Scientific Interests: As a cancer patient, my only desire is to work on something than can solve problems on people's health. My first research experience was in Michigan State University, working on the contribution of glutamate receptors to cytotoxicity produced by methylmercury in forebrain astrocytes – a gene x environmental interaction associated with amyotrophic lateral sclerosis, in Dr. William D. Atchison's lab. I would like to have the opportunity to work in a lab where the focus of study is cancer.

Career Goals and Plan: My main goal is to achieve my bachelor's degree and take the GRE test to apply for graduate school. I want to achieve a Ph.D. in toxicology as a first option; otherwise, a Ph.D. in analytical chemistry.

ENDURE Summer Research Experience

Research Experience Institution: Michigan State University

Research Mentors: Dr. William D. Atchison, Gretchen Rivera

Diversity Poster Session: Theme B: Neural Excitability, Synapses, and Glia, L-37

Project Title: Contribution of Glutamate Receptors to Cytotoxicity Produced by Methylmercury (MeHg) in Forebrain Astrocytes - A Gene X Environmental Interaction Associated with Amyotrophic Lateral Sclerosis

Abstract: The consumption of methylmercury (MeHg) through fish-rich diets has been linked with neurobehavioral and cognitive decline, causing similar symptomology to amyotrophic lateral sclerosis (ALS). The organic mercury compounds have been reported to agglomerate in the cerebral cortex, brainstem, and spinal cord, which are the same areas known to degenerate during ALS. Excitotoxicity play a role in certain disorders of the motor system. Interference with glutamate-mediated toxicity is so far the only neuroprotective therapeutic strategy that has shown benefit in terms of slowing disease progresion in ALS patients. The objective of the present study is to test viability of forebrain astrocytes from superoxide dismutase-1G93A (G93A) mice after MeHg exposure, by analyzing the role of glutamate NMDA and AMPA antagonist receptors. Through the isolation and culture of mouse cortical and cerebellar astrocytes, MeHg exposure and pharmacologic tools, viability test, and imaging using microscopy we may be able to objectively determine the role of glutamate NMDA and AMPA antagonist receptors. We predict that the glutamate receptors NMDA and AMPA antagonist will protect the cell to avoid cytotoxicity due to MeHg. We used the viability calcein assay to calculate an average of the percentage of viability, which results that astrocytes with exposure of lower concentrations of MeHg has a higher percentage of viability. Therefore, contrary to our hypothesis, glutamate receptors antagonists did not protect astrocytes from MeHg induced cytotoxicity.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Nicole M. Camacho-Fontánez

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Biology, 2021

Scientific Interests: I am interested in the molecular and cellular mechanisms of psychiatric disorders and how their characterization may lead to the development of novel pharmacological treatments. Insufficient molecular targets have burdened the design of efficient and enduring medication. Psychiatric research is critical to address this concern that drastically limits mental health treatment.

Career Goals and Plan: I am determined to achieve an M.D. with a specialization in psychiatry and a Ph.D. in neuroscience. My initiative towards these degrees stems from my determination to perform translational research with the intent to improve the health and quality of life of patients. I aim to receive the relevant training in order to understand psychiatric diseases, identify targets for treatment and be part of a new generation of clinical scientist determined to improve mental health care.

ENDURE Summer Research Experience

Research Experience Institution: Michigan State University

Research Mentors: Dr. Michelle Mazei-Robison, Amber Garrison

Diversity Poster Session: Theme G: Motivation and Emotion, N-46

Project Title: Characterization of Morphine-Regulated Neuropeptides in the Ventral Tegmental Area

Abstract: Morphine is an opiate drug administered as treatment for chronic pain, despite its addictive properties. Chronic morphine exposure induces synaptic, genetic, and structural neuroadaptations in the ventral tegmental area (VTA), where dysregulation of dopaminergic (DA) neurons may contribute to drug-related behavior. Gene expression analysis following morphine administration using translating ribosome affinity purification found a twelve-fold increase in expression of neuromedin S (NMS) in VTA DA neurons. The subset of NMS expressing VTA DA neurons was determined in order to understand how activation of this novel DA neuron population affects drug behavior. The number of NMS expressing DA neurons was quantified using immunohistochemistry for EGFP and tyrosine hydroxylase (TH) of NMS-Cre mice crossed with Rosa26-L10-EGFP. Dopaminergic NMS-expressing cells were found concentrated in the medial parabrachial pigmented nucleus but constitute less than 5% of dopamine cells. Given the small proportion of TH cells expressing NMS, our data suggest that chronic morphine administration causes a large induction of NMS in individual neurons.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Harim Delgado-Seo

Home Institution: Ana G. Mendez University, Gurabo

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Biology, 2020

Scientific Interests: All the experiences and knowledge I have gained through my past and current research experiences have confirmed that I will unquestionably pursue a career in neurophysiology. The digestive system is the most complex body system, after the brain, as it is in charge of breaking down foods mechanically and chemically for our survival. I feel strongly about researching disorders related to the alimentary canal (from ingestion to absorption to excretion) that are difficult to diagnose or treat due to the heterogeneous nature of the disorders.

Career Goals and Plan: After I graduate, I will apply for a Ph.D. in neuroscience or physiology with the possibility of pursuing translational research related to the digestive system, primarily neurogastroenterology and endocrinology, owing to my formative experience at MSU. The program's objective of bridging the gap between research and medicine by forwarding research findings to clinical practice is one that I share, and I will integrate as a definitive part of my career as a neuroscientist.

ENDURE Summer Research Experience

Research Experience Institution: Michigan State University

Research Mentor: Dr. Gina Leinninger

Diversity Poster Session: Theme F: Integrative Physiology and Behavior, N-31

Project Title: Do the Neurotensin and FGF-21 Signaling Systems Interact to Suppress Caloric Intake?

Abstract: Obesity is a medical problem that shortens lifespan. Therefore, it is crucial that we understand the mechanisms that underlie weight loss. The neuropeptide neurotensin (Nts) acts via the neurotensin receptor 1 (NtsR1) in the brain to suppress appetite, while the hepatokine fibroblast growth factor 21 (FGF-21) diminishes sugar intake that leads to weight loss. Given that endocrine FGF-21 and central Nts-NtsR1 invoke similar ingestive behaviors, we hypothesize that both systems may interact to suppress caloric intake. If accurate, then we would expect FGF21-mediated effects to be blunted in mice lacking NtsR1 (called NtsR1-KO mice). To examine this hypothesis, we treated wild type control mice and NtsR1-KO mice with FGF-21 and assess their body weight and sucrose intake. Our results showed that WT mice did not decrease sucrose intake after FGF-21 treatment as observed in previous studies. These discrepancies could be due to the advanced age of the mice (~1 year), which may have blunted effects of FGF-21 treatment compared to studies performed in 8-16 weeks old mice. Future work will investigate younger, lean mice to determine how peripheral FGF-21 might mechanistically engage.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Midori Flores

Home Institution: St. Mary's University

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Undergraduate Academic Level: Sophomore

Undergraduate Major and Expected Graduation Date: Environmental Science, 2022

Scientific Interests: I am enamored by scientific research and have prior experience doing personal research, and of course, the research supported by ENDURE at Michigan State University through the Bridge to Ph.D. in Neuroscience Program. I am a detail-oriented research assistant, who is highly proficient in understanding scientific papers, providing computational research support, and preparing samples and specimens for testing. Moreover, I am eager to contribute to environmental science, public health, and epidemiological research.

Career Goals and Plan: My career goals include becoming an epidemiologist. Beyond helping those in the local community, being an epidemiologist to me also means helping people across oceans and borders, whether that's increasing the public's awareness of a certain disease spreading quickly in an area or coming up with a plan to support research and public health protocols. To help others is in my nature and it is what would bring me fulfillment in a career. My research experience through ENDURE supports my graduate school plans of obtaining my Ph.D. in epidemiology.

ENDURE Summer Research Experience

Research Experience Institution: Michigan State University

Research Mentors: Dr. William D. Atchison, Gretchen Rivera Lopez

Diversity Poster Session: Theme B: Neural Excitability, Synapses, and Glia, L-22

Project Title: Methylmercury-Induced Excitotoxicity in Forebrain Astrocytes and Pharmocological Mediation by Conotoxin and Nimodipine

Abstract: Methylmercury (MeHg) toxicity affects both neurons and supporting glial cells- including astrocytes- which induces sensory disturbances such as tunnel vision, and motor dysfunction such as ataxia. On a cellular level, MeHg toxicity rouses a spontaneous release of glutamte, which then increases intracellular [Ca2+], damages mitochondria, causes reactive oxygen species formation, and ultimately leads to cell death. In an effort to mediate MeHg-induced cytotoxicity, calcium channel blockers, conotoxin and nimodipine, were used to treat isolated astrocytes from SOD1 mice which were then exposed to 2μM and 5μM concentrations of MeHg. A calcein viability assay and fluorescence microscopy was performed to analyze the extent of protection that the calcium channel blockers enacted on the astrocytes. Viability percentages were calculated from average cell counts from control and experimental assays. It was hypothesized that treatments of conotoxin and nimodipine would inhibit extracellular Ca2+ from entering the cell. Results concluded that the calcium channel blockers increased cell viability with the lower concentrations of MeHg.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Angel Ojeda

Home Institution: University of Puerto Rico-Cayey

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Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Biology, 2021

Mentor at Home Institution: Dr. Robert Ross

Scientific Interests: My research interest in the scientific community has shifted from one main concentration to another since I started college. At first, I longed to become a physician, then I decided to get experience doing research and see if a Ph.D. suits me. Now after having accomplished two summer research internships at Michigan State University, I can say with firmness that a Ph.D. in neuroscience is what I want. My main field of interest in neuroscience is to see how the human body responds to different environmental toxicants and how exogenous treatments with supplements can affect these responses.

Career Goals and Plan: I consider myself a very competitive, dedicated, honest, and intelligent student; yet, very humble with an eagerness to help others. Therefore, it is my greatest desire to be able to share these qualities in a career that will also expand my limitations, where I feel comfortable helping others. The world of science has that to offer and I plan to keep on going. To ensure I make the right choice I will continue doing research and exploring different areas of the Ph.D. For now, I am looking forward to a Ph.D. career in neuroscience at Michigan State University.

Research Experience Institution: Michigan State University

Research Mentor: Dr. William D. Atchison

Diversity Poster Session: Theme C: Neurodegenerative Disorders and Injury, M-16

Project Title: Studying the Role of ω-3 Polyunsaturated Fatty Acids (PUFAs) on Neurodevelopmental and Neurodegenerative diseases Using *C. elegans* as a Biological Model

Abstract: Omega-3 PUFAs are essential fatty acids that are suggested to be critical for neurodevelopment and health in general. Although several cohort studies showed that omega-3 PUFAs play an important role in neurodevelopment and are neuroprotective, the effects of omega-3 PUFAs on neurodevelopmental and neurodegenerative diseases remain controversial. Furthermore, the mechanisms by which PUFAs modulate neurodevelopment and neurodegeneration are largely unknown. We hypothesized that each specific omega-3 PUFA plays a unique role in neurodevelopment. In this project, we used *Caenorhabditis elegans* (*C. elegans*) to study the effects of each omega-3 PUFA on neurodevelopment and neurodegeneration. C. elegans has its own biosynthetic-pathway for both omega-3 and omega-6 fatty acids; therefore, we can genetically knock out genes in the PUFA biosynthetic-pathways to study omega-3 and omega-6 effects. We created a novel genetic hybrid *C. elegans* in which specific neurons were labeled with green fluorescent protein in a worm strain that lacks specific PUFA metabolic enzymes. In addition, we treated the genetically modified *C. elegans* with specific PUFAs. We studied how exogenous PUFA treatment and manipulation of the biosynthetic pathway affects its neurodevelopment. The results from these studies allowed us to dissect the role of omega-3 PUFAs in neurodevelopment.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Marina Pérez

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Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Biology, 2021

Mentor at Home Institution: Dr. Robert Ross

Scientific Interests: My research interest is to earn D.V.M./Ph.D. degrees, concentrating in neuroscience. My summer research experience at MSU gave me an insight into neuroscience and adult-onset neurodegenerative diseases. This experience has enhanced my understanding of the molecular pathogenesis of different neurological disorders and let me answer the question, is this what I want to do for the rest of my life? And the answer is yes.

Career Goals and Plan: The goal of my professional career is to become a veterinary scientist and research more effective ways of elucidating the pathophysiology of certain diseases that may not have long-term therapies. Having a rescue pet that has idiopathic epilepsy, a neurological disorder which does not have a long-term cure, it would be extremely rewarding finding a cure for this and similar neurological disorders commonly found in animals, and maybe even apply this type of research to human neurological diseases.

ENDURE Summer Research Experience

Research Experience Institution: Michigan State University

Research Mentor: Dr. William D. Atchison

Diversity Poster Session: Theme C: Neurodegenerative Disorders and Injury, M-14

Project Title: Immunohistochemical Analysis of Endogenous α-Synuclein in the Mouse Myenteric Plexus

Abstract: Constipation is a predominant complaint in 61.4% of patients with Parkinson's disease (PD). Colonic motility is mediated by the coordinated activity of the excitatory and inhibitory motor neurons found within the myenteric plexus of the enteric nervous system (ENS). PD is a progressive nervous system disorder that is associated with alpha synuclein (α-syn) pathology. α-syn, a presynaptic terminal protein involved in vesicular neurotransmitter release, is found to aggregate in the ENS of PD patients. Disruptions in neurotransmission within the ENS may lead to colonic dysmotility. Our objective was to find which neurotransmitter neurons and nerve fibers overlap with endogenous α-syn neurons and nerve fibers within the myenteric plexus of the mouse colon that regulate colonic motility. We performed immunohistochemistry on longitudinal muscle myenteric preps (LMMP) of the mouse proximal colon by using choline acetyltransferase (ChAT), nitric oxide synthase (NOS), tyrosine hydroxylase (TH), and vesicular nucleotide transporter (VNUT), to label for neurotransmitters: acetylcholine, nitric oxide, dopamine, and ATP. We hypothesized that α-syn would be immunoreactive with cholinergic, purinergic, and dopaminergic neurons. We hoped to draw parallels between the expression of endogenous α-syn and the aggregated α-syn within the myenteric plexus of the mouse colon.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Krystal Santiago-Colón

Home Institution: University of Puerto Rico-Cayey

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Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Biology, 2021

Mentor at Home Institution: Dr. Mar-a de Jess

Scientific Interests: Witnessing first-hand how easily neuroscience merges with other disciplines made me realize that my interests lie in figuring out the problem-solving approaches that neuroscience encompasses. My research interests are in neurotoxicology, neuroendocrinology and neuroplasticity.

Career Goals and Plan: After finishing my baccalaureate degree, I plan to pursue a Ph.D. in Pharmacology or Neuroscience.

ENDURE Summer Research Experience

Research Experience Institution: Michigan State University

Research Mentor): Dr. Gina Leinninger, Patricia Perez-Bonilla

Diversity Poster Session: Theme F: Integrative Physiology and Behavior, N-18

Project Title: Activation of VTA NtsR1 Neurons to Suppress Feeding and Promote Weight Loss

Abstract: Behaviors that impact energy balance, like the motivation to eat and locomotor activity, are mediated by dopaminergic neurons of the ventral tegmental area (VTA). Yet, dopamine neurons are molecularly heterogeneous and project to different brain sites, and it remains unclear which specific VTA neurons exert behaviors to support weight loss. Neurotensin (Nts) released to the VTA promotes weight-loss behaviors in mice, which is dependent on neurotensin receptor-1 (NtsR1). Interestingly, only a subset of VTA neurons express NtsR1 and project solely to the nucleus accumbens (NAc). Therefore, we hypothesize that selective activation of VTA NtsR1 neurons increases activation of downstream NAc neurons and suppresses feeding to support weight loss. To investigate this, we used Cre-dependent Designer Receptors Activated by Designer Drugs (DREADDs) to selectively activate VTA NtsR1 neurons of diet-induced obese NtsR1Cre mice. Chronic activation of VTA NtsR1 neurons in diet-induced obese mice promoted sustained locomotor activity and decreased food intake. However, activating these neurons did not alter food intake after overnight fasting or their sucrose preference.

ENHANCING NEUROSCIENCE DIVERSITY WITH TENNESSEE STATE UNIVERSITY-NEUROSCIENCE EDUCATION AND RESEARCH VANDERBILT EXPERIENCE (TSU-NERVE)

TENNESSEE STATE UNIVERSITY

http://www.tnstate.edu/psychology/tsunerve.aspx

Principal Investigator: Kiesa Kelly, Ph.D. | Tennessee State University

Co-Investigator: David Zald, Ph.D. | Vanderbilt University

Partner Institution: Vanderbilt University

Program Description

The TSU-NERVE program in partnership with Vanderbilt University will prepare underrepresented students majoring in STEM disciplines at Tennessee State University, a Historically Black College and University (HBCU), for graduate study and careers in neuroscience.

The TSU-NERVE program will provide quality research, didactic, and professional development opportunities to support programmatic initiatives and goals: free Neuroscience courses, seminars, and retreats at Vanderbilt University; a 6-part workshop series on graduate school admissions that will involve directors of neuroscience doctoral programs from around the country; weekly neuroscience seminars during the academic year for the two years of the program; up to 3 semesters of neuroscience courses at Vanderbilt; research experiences in Vanderbilt neuroscience labs during the academic year; and summer research experiences including at Vanderbilt or one of the T32-funded neuroscience institutions (University of Michigan, University of Minnesota, Oregon Health & Science University, Princeton University, and University of Southern California) with which a partnership has been formed.

Carefully crafted retention plans will maximize TSU-NERVE trainee completion and success. These include: 1) a Vanderbilt Teaching Assistant to tutor students in rigorous Vanderbilt neuroscience coursework, 2) Vanderbilt mentors who will work with each TSU-NERVE student in his/her academic year lab placements, and 3) individual mentoring and advising from program directors that include evaluation of participant progress. Among enrolled TSU students, TSU-NERVE draws from the University Honors Program and TSU's NSF-funded HBCU-Undergraduate Programs for STEM majors.

TSU-NERVE will: 1) recruit talented (primarily African American) STEM majors from TSU interested in neuroscience, 2) provide appropriate support and scaffolding for these students as they receive quality research and didactic experiences at major research institutions, and 3) advance students from underrepresented backgrounds into doctoral programs in neuroscience with well-crafted professional development activities. Well-conceived admissions and retention plans will increase completion rates. Additionally, comprehensive formative and summative assessments will be conducted in both program evaluation and the career development of trainees to ensure the success of the TSU-NERVE program.

Additional Program Team Members

Program Co-Director: Lisa A. de la Mothe, Ph.D. | Tennessee State University

Program Co-Director: Hugh Fentress, Ph.D. | Tennessee State University

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Autumn Brunson

Home Institution: Tennessee State University

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Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Biology, 2021

Mentors at Home Institution: Dr. Kiesa Kelly, Dr. Lisa de la Mothe, Dr. Quincy Quick

Scientific Interests: The scientific research that I conducted involves the study of the mechanisms in responding to endoplasmic reticulum stress and the resulting effects on the cuprizone model of remyelination. My research interests include the study of demyelinating disorders, drugs and addiction, and Neurophysiology.

Career Goals and Plan: After receiving my bachelor's degree in biology at Tennessee State University and research concentrating on neuroscience, I intend to pursue an M.D./Ph.D. My Ph.D. will be in biomechanics and tissue engineering, and my M.D. will be focused on neurosurgery. My goal is to practice neurosurgery and collaborate with a lab and conduct research focused on multiple sclerosis.

ENDURE Summer Research Experience

Research Experience Institution: Harvard University

Research Mentors: Dr. Corey Harwell, Dr. Miguel Turrero Garcia, Tiara Lacey

Diversity Poster Session: Theme A: Development, L-5

Project Title: Neural Correlates of Predator Odor-Induced Anxiety in the Lateral Septum

Abstract: Anxiety disorders are the most common mental illness in the world. However, we lack a mechanistic basis of anxiety-related circuit function, which is necessary to understand the neural circuits involved in these types of disorders. The lateral septum in the basal forebrain has been implicated in fear and anxiety-related behavioral responses in mice, and the neurons in the lateral septum are diverse. We aim to understand the innate, behavioral, and physiological responses to predator odor--specifically, mechanisms by which lateral septal neurons derived from the NKX2.1 progenitors, play a role in anxiety behaviors. The predator odor test is a behavioral paradigm involving the exposure of mice to the innately aversive smell of trimethylthiazoline (TMT), an odorant derived from fox urine. This smell is known to induce an anxiogenic/fear-like response in mice that correlates with the activation of c-Fos, a marker for neural circuit activity, in the lateral septum. In this study, we use a genetic mouse model characterized by the absence of a specific subset of neurons in the lateral septum, in order to understand the role of those neurons in fear. We observed a reduction in anxiety-related behavioral responses.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Shelby Davis

Home Institution: Tennessee State University

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Biology and Psychology, 2020

Mentors at Home Institution: Dr. Quincy Quick, Dr. Lisa de la Mothe, Dr. Kiesa Kelly

Scientific Interests: Psychologists aim to explain how thinking, feeling, and behaviors change throughout an individual's life. The most prevalent mental disorder in the United States is anxiety, affecting about 19.1% of the population every year. My specific research interests involve the study of behavioral and developmental disorders such as anxiety and depression in children and adolescents.

Career Goals and Plan: My current goals include graduating and obtaining my Bachelor of Science in biology and psychology from Tennessee State University. My long-term career goals include pursuing a master's degree and Ph.D. in Clinical Child Psychology. In preparation for achieving my career goals, I have conducted research at three different institutions, including the University of Minnesota at Twin Cities, Vanderbilt University, and Georgetown University.

ENDURE Summer Research Experience

Research Experience Institution: Georgetown University

Research Mentors: Dr. Guinevere Eden, Dr. Anna Matejko, Melanie Lozano

Diversity Poster Session: Theme H: Cognition, O-27

Project Title: The Relationship Between Phonological Processing and Math and Reading Skills

Abstract: In a recent study, DeSmedt et al. showed that Phoneme Elision was specifically related to small arithmetic problems (small addition), in developing children. This research led to the question of whether the same relationship could be found in children with reading and math learning disabilities. Past findings led to the present hypothesis that phonological awareness tasks are correlated with the ability to perform well on retrieval-based arithmetic problems and not procedural-based arithmetic. This hypothesis was tested by directly measuring phonological awareness and arithmetic skills during word processing and math tasks and running a correlation analysis between Phoneme Elision and different arithmetic tasks. We also questioned whether these same relationships can be shown between other phonological processing tasks and arithmetic skills. To test this, we ran regression analyses between phonological awareness tasks such as word processing, working memory, rapid naming, and arithmetic skills. Our analysis showed that there was a correlation between Phoneme Elision and single-digit addition and subtraction, and double-digit addition.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Brianna McCollum

Home Institution: Tennessee State University

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Biology and Psychology, 2020

Mentors at Home Institution: Dr. Kiesa Kelly, Dr. Lisa de la Mothe, Dr. Quincy Quick

Scientific Interests: In today's world, there are so many people who struggle everyday with depression and trying to remain motivated. I am currently interested in the medial prefontal cortex, involved in motivation and reward. I also want to learn more about arousal, learning, and attention in the brain.

Career Goals and Plan: When I graduate from Tennessee State University, I will receive my Bachelor of Science in biology and psychology. After graduating I plan to obtain my Master of Biomedical Sciences and subsequently pursue an M.D./Ph.D. in molecular biology and one day become an OB/GYN.

ENDURE Summer Research Experience

Research Experience Institution: Duke University

Research Mentor: Dr. Corrie Camalier

Diversity Poster Session: Theme F: Integrative Physiology and Behavior, N-24

Project Title: State Dependent Effects of Transcranial Magnetic Stimulation: Choice and Preparation of Model

Abstract: Transcranial Magnetic Stimulation (TMS) can be used as a research tool to study brain activity. TMS has a broad spectrum of different uses and applications for patients with different neurological and neuropsychiatric disorders and is increasingly used as noninvasive neuromodulatory therapy for depression, Parkinson's, and epilepsy. We tested this in non-human primates because their brain size and structure are the closet to humans. In order to use TMS in a monkey the eye has to be fixated in one position for a set amount of time to administer the pulse. The ultimate goal is to be able to see what part of the brain is being positively affected by TMS pulses.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Aliyah Muhammad

Home Institution: Tennessee State University

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Computer Science, 2021

Mentors at Home Institution: Dr. Lisa de la Mothe, Dr. Quincy Quick, Dr. Kiesa Kelly

Scientific Interests: I am interested in conducting research related to cognitive functioning and computational neuroscience.

Career Goals and Plan: Upon completion of my Bachelor of Science in computer science, I plan on transitioning into the workforce in an area related to computational neuroscience. This experience will provide me with a stronger foundation in the field for future graduate programs.

ENDURE Summer Research Experience

Research Experience Institution: University of Southern California

Research Mentor: Dr. April Thames

Diversity Poster Session: Theme I: Techniques, P-3

Project Title: Manual and Automated Segmentation of Hippocampal Subregion Volume in Persons Living with HIV

Abstract: HIV-associated neurocognitive disorder (HAND) is the result of neural damage caused by HIV replication and immune activation, ranging from the most severe form of HAND, called HIV-associated Dementia (HAD), to the mildest form called asymptomatic neurocognitive impairment (ANI). Using magnetic resonance imaging (MRI), which has opened up noninvasive exploration of the human brain with increasing amounts of detail, the volumes of hippocampal subregions in six right-handed aging men living with HIV were assessed. Our data showed that the hippocampal subregions of HIV infected patients were smaller than brains of non-HIV infected patients. These findings suggest HIV possibly contributes to neurological disorders.

NEUROSCIENCE RESEARCH OPPORTUNITIES TO INCREASE DIVERSITY (Neuro-ID)

UNIVERSITY OF PUERTO RICO, RIO PIEDRAS

http://neuroid.uprrp.edu/

Principal Investigator: Jose García-Arrarás, Ph.D. | University of Puerto Rico, Rio Piedras

Principal Investigator: Carmen S. Maldonado-Vlaar, Ph.D. | University of Puerto Rico, Rio Piedras

Partner Institutions: Inter American University of Puerto Rico- Bayamón, Metropolitan University, Sacred Heart University of Puerto Rico

Program Description

Neuroscience Research Opportunities to Increase Diversity (NeuroID) from the University of Puerto Rico Rio Piedras Campus aims to increase the opportunities available for undergraduate students in the area of Neurosciences. The proposal makes use of the strong neuroscience expertise among UPR investigators and fortifies the underlying neuroscience network that joins undergraduate students, island investigators and their collaborators in mainland institutions.

The training program consists of three major components: (1) research experience – an intense research experience during the academic year and a summer experience in a laboratory at an institution in the mainland USA, such as Harvard, Yale, Univ. Colorado Denver, Univ. of Vermont, Northwestern University, and Univ. of Miami, that have active T32 training grants in neuroscience and/or excellent track record in recruiting and training underrepresented minorities. (2) academic training participation in seminars, workshops and selected courses to enhance their knowledge in neurobiology and understanding of a research career, and (3) student development activities — participants will enter a mentoring program that includes community outreach activities, scientific writing, oral presentations and other professional enhancement activities.

The proposed activities, together with an established mentoring program with members of the neuroscience community, will serve to increase the student competitiveness and enhance their interest in continuing a research career in neuroscience. The NeuroID program will extend the impact of other successful programs at the University of Puerto Rico, not only by focusing on the neuroscience field but also by greatly expanding the number of possible mentors, increasing the pool of available applicants as well as providing an inclusive and broader training program.

Additional Program Team Members

Program Administrator: Zobeida Díaz Pérez | University of Puerto Rico, Rio Piedras

Administrative Assistant: Marimar Velázquez-Vargas | University of Puerto Rico, Rio Piedras

Karen Gonzalez, Ph.D. | Metropolitan University

Armando Rodríguez, Ph.D. | Inter American University of Puerto Rico- Bayamón

Agda E. Cordero Murillo – Sacred Heart University of Puerto Rico

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Amanda Anqueira-Gonzalez

Home Institution: University of Puerto Rico, Rio Piedras

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Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Cellular and Molecular Biology, 2021

Mentor at Home Institution: Dr. Alfredo Ghezzi

Scientific Interests: My interests range from the molecular to behavioral neuroscience, considering a systems neuroscience approach. My current research interests are mainly focused on the study of memory from a cellular and molecular perspective, including cellular mechanisms, genetic bases of behavior, receptors, and neurotransmitters, among others.

Career Goals and Plan: My career goals include finishing my bachelor's degree and obtaining a Ph.D. in Neuroscience. After I complete my Ph.D., I aim to complete post-doctoral training as well. These steps are crucial to me, given I want to become a principal investigator in academia which will allow me to mentor students, as well as fuel the neuroscience field with the knowledge obtained from my research laboratory.

ENDURE Summer Research Experience

Research Experience Institution: University of Puerto Rico, Rio Piedras

Research Mentor: Dr. Jose García-Arrarás

Diversity Poster Session: Theme F: Integrative Physiology and Behavior, N-11

Project Title: The Molecular Mechanisms of Ethanol Neuroadaptation

Abstract: Alcohol consumption is known to induce cognitive impairments mainly affecting executive functions, episodic memory, and other capacities related to brain function. Nevertheless, the cellular and molecular mechanisms underlying such interactions are still unknown. Recent evidence has uncovered a similar interaction between ethanol exposure and cognitive function in the fruit fly, *Drosophila melanogaster*, which opens the way for molecular studies in a genetically tractable model system. Larvae that have undergone prolonged chronic ethanol exposure seem to successfully avoid an odorant paired with the heat shock just as well as control ethanol-naive larvae, which is suggestive of ethanol-induced neuroadaptations. We aimed to understand the genetic and cellular components responsible for this adaptation. For this, we employed RNA sequencing technology to evaluate differences in gene expression in the brain of larvae chronically exposed to ethanol and in control larvae.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Shantée Ayala Rosario

Home Institution: Inter American University of Puerto Rico

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Biotechnology, 2020

Mentor at Home Institution: Dr. Timothy Hendricks

Scientific Interests: During my time as a recruitment candidate in the Marine Corps, I witnessed how many civilians and military members treated Post-traumatic stress disorder (PTSD) as something the individual can control. My second encounter with PTSD came during the aftermath of Hurricane Maria, which caused an increased incidence in my hometown. These experiences led me to retract my enlistment to prioritize my education and use research to understand neurological disorders. I am interested in studying the neural correlates of anxiety disorders and would like to focus on how associative fear memories are triggered.

Career Goals and Plan: Upon completion of my undergraduate education, I plan to obtain a Ph.D. in neuroscience. However, I opt to be open-minded through those professional years. Afterward, I aim to pursue a tenure track position in an academic institution to contribute to the understanding of the neural substrates and correlates of neurological disorders with special interest in PTSD. I seek to be a well-rounded scientist with great potential in a wide range of disciplines.

ENDURE Summer Research Experience

Research Experience Institution: University of Puerto Rico, Rio Piedras

Research Mentors: Dr. Gregory Quirk, Dr. Hector Bravo

Diversity Poster Session: Theme F: Integrative Physiology and Behavior, N-13

Project Title: Strategies of Conflict-Based Decision Making

Abstract: Pursuit of reward and avoidance of adversity are major behavioral motivators. Failure to balance them results in maladaptive behaviors, which may underlie many pathological conditions. Little is known about how their circuits interact to produce adaptive behaviors. We introduced a conflict-task where a 30sec tone that co-terminates with a 2s foot shock, and a light that indicates food availability are presented simultaneously. Rats must choose to avoid shock by stepping on a platform or press a lever to receive a reward and risk getting shocked. Twenty-six percent of rats spent all of the time on the platform and never pressed for food. This lack of food-seeking is the cost of excessive avoidance. Thirty percent of rats engaged in excessive food-seeking, showing little to no avoidance. The foot shocks received are the cost of excessive food-seeking. Neither of these behaviors is optimal. Lastly, 44% of rats accommodated both food-seeking and avoidance behaviors, by timing the occurrence of the shock. They increased food-seeking during the early portion of the tone and avoided as it progressed. These findings show naturally occurring subgroups, characterized by contrasting behavioral responses to threat-reward conflict.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Alberto Calderon

Home Institution: Ana G. Méndez University

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Microbiology, 2020

Scientific Interests: My short-term goal is to graduate with a degree in microbiology; in the long term, to be able to unite my interests in neuroscience with those in microbiology, and to do a PhD by combining both areas of science.

Career Goals and Plan: My goal is to acquire knowledge, develop skills and abilities, meet the established goals, and have a doctorate in neuroscience combined with microbiology.

ENDURE Summer Research Experience

Research Experience Institution: University of Puerto Rico, Rio Piedras

Research Mentor: Dr. Jose García-Arrarás

Project Title: Nerve Fiber Depolarization Effect on Intestinal Regeneration in the Sea Cucumber *Holothuria glaberrima*

Abstract: Intestinal regeneration is a capacity that echinoderms possess. This mechanism has been studied in the sea cucumber *Holothuria glaberrima*, a marine organism with the ability to regenerate most of its internal organs. Cell cultures were used to observe and analyze the factors that modulate intestinal regeneration. In this research, the possible effect of the tissue culture media was studied. Sodium chloride (NaCl) and potassium chloride (KCl) concentrations in media were altered to determine their effect on tissue regeneration. Increases in KCl are known to cause changes in the depolarization of the nervous tissues. Therefore, the changes observed were analyzed in terms of osmolarity and/or depolarization effects.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Stephanie Cruz Rodriguez

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Biomedical Engineering, 2021

Mentor at Home Institution: Dr. Edwin Florez Gomez

Scientific Interests: My scientific interest is based in behavioral activity. I want to acquire the capacity to develop technics that facilitate the research strategies, mimic and manipulate behaviors to get expected results. Currently what is being achieved in the research experience is the use of a big data approach to solve problems that enable multivariate analysis to facilitate the growth of this field of study. Bees are the interest of this study due to their ability to maintain standards inside the hive while struggling because of climate change, contaminants and diseases that affect their health.

Career Goals and Plan: My future career goals are to enter a Ph.D. program that focuses in neural engineering and base my research in rehabilitation processes. In this program my interest in biomedical engineering and neuroscience can be implemented. My plans are to continue in the engineering career to design and create devices, applying research for further study and improvements. With the research in rehabilitation I want to apply techniques and developments with the innovative designs to implement them and find clinical solutions for victims affected by the neurological conditions that reduce mobility.

ENDURE Summer Research Experience

Research Experience Institution: University of Puerto Rico, Rio Piedras

Research Mentors: Dr. Jose Agosto Rivera, Dr. Jose García-Arrarás, Dr. Carmen Maldonado-Vlaar

Project Title: Big Data Approach to Understand the Relationship between Shift Work and Colony Performance

Abstract: Previous studies in our laboratory suggested that there is shift work in honey bee society. However, these experiments were extremely labor intensive and when we analyzed more colonies a great degree of variation was observed. This raised the question about the evolutionary significance of shift work. To solve these issues, we formed an interdisciplinary collaboration with computer scientists to automate the data collection, behavioral classification and data analysis processes. Data was collected 24/7 using video recordings, environmental sensors and photos of internal resources. We hypothesized that by using this big data approach we would be able to validate the finding of shift work in honey bees and examine its relationship with colony performance. Over the past two years, we recorded one hive and developed the automatic detection and behavioral classification methods using machine learning. We tagged approximately ten thousand bees, recorded ten hives, and followed their colony performance using measures of reproduction, internal resources, and colony environment regulations. We predicted that the diversity of shift patterns would be positively correlated with colony performance.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Carolina Dasta Cruz

Home Institution: University of Puerto Rico, Rio Piedras

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Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Cellular-Molecular Biology, 2021

Mentors at Home Institution: Dr. Alfredo Ghezzi, Dr. Carmen Maldonado-Vlaar

Scientific Interests: I often find myself asking why things are the way they are and how did they get to be that way? These questions motivate me to learn how the brain adapts to situations such as stress, sleep deprivation, fear and environmental stimuli. I am particularly interested in studying the underlying molecular and behavioral aspects of social decision-making, like reward and addiction. I am also interested in understanding the causes and mechanisms that lead to brain dysfunction in neurodegenerative disorders that occur increasingly with advancing age.

Career Goals and Plan: After completing my bachelor's degree in cellular-molecular biology, I plan on attending graduate school to pursue a Ph.D. in neuroscience. Afterwards, I would like to obtain a postdoctoral position and, eventually, establish my own laboratory. I wish to share the knowledge I obtain while completing these experiences and become a mentor and a role model to other underrepresented students that are interested in studying neuroscience.

ENDURE Summer Research Experience

Research Experience Institution: Princeton University

Research Mentors: Dr. Stefan Oline, Dr. Annegret Falkner

Project Title: Functional Dissection of a Hypothalamic Striatal Projection

Abstract: The medial preoptic area (MPOA) is a region that has been implicated in different social behaviors and has widespread projections throughout the brain. Recent studies have identified the ventrolateral part of the ventromedial hypothalamus (VMHvl) as playing a role in aggression-seeking behaviors. We were interested in finding if there is a circuit level connection between chronic defeat and social reinforcement. Our focus was on the ventral tegmental area (VTA) and nucleus accumbens (NAc). We expected to determine if the specific MPOA neurons that project to the VMHvl also project to the VTA and NAc. We sought to distinguish between two hypotheses: first, that overlapping MPOA subpopulations project to both neurons in the VMHvl and mesolimbic structures, and alternatively if these populations are segregated in the MPOA. To do this, we injected cholera toxin B, a retrograde neuroanatomical tracer, into the VMHvl and VTA/NAc. In order to observe these projections, we counterstained the tissue slices with DAPI and take fluorescent images using the NanoZoomer. We observed a segregation of the cells in these regions, which suggests that these cells do not follow the same projection as VMHvl.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Norelis M. Diaz-Rodriguez

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Psychology, 2020

Mentor at Home Institution: Dr. Jose Luis Agosto

Career Goals and Plan: I intend to fulfill my academic purpose of obtaining a Ph.D. in neuroscience with an emphasis on the neurobiology of mood disorders. After graduate school, I plan to pursue a post-doctorate degree, publish important work on the neurobiology of depression, and get a tenure track position in a research-intensive institution.

ENDURE Summer Research Experience

Research Experience Institution: University of Michigan

Research Mentor: Dr. Jonathan Morrow

Diversity Poster Session: Theme F: Integrative Physiology and Behavior, N-20

Project Title: Pumilio in Hemocytes Regulate Sleep Behavior

Abstract: Despite major advantages in our knowledge of neural circuits, genes and biological processes that underlie sleep in *Drosophila melanogaster*, the specific molecular pathways that orchestrate this response remains unknown. Previous studies have shown that peptidoglycan fragments from bacterial cell walls processed by macrophages such as muramyl peptides can induce sleep behavior. This finding combined with other recent studies suggests that macrophages play a role in sleep regulation. We have previously shown that pumilio (pum), a translational repressor, produces an abnormal sleep pattern when it is knocked down. In a screen to identify the specific tissues responsible for pum actions on sleep, we found that pum knockdown in hemocytes decreases sleep, while its overexpression increases sleep. To dissect the mechanisms by which pum manipulations in hemocytes change sleep, we investigated the expression of hemocytes products such as antimicrobial peptides and inflammation markers using real-time PCR. Moreover, we examined the impact of pum manipulations on hemocyte levels using GFP-labeled hemocytes and fluorescence microscopy.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Andrea Edwards

Home Institution: University of Puerto Rico, Rio Piedras

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Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Biology, 2021

Mentors at Home Institution: Dr. Amaya Miquelajauregui-Graf, Dr. Jose García-Arrarás, Dr. Carmen Maldonado-Vlaar

Scientific Interests: I am interested in pursuing research topics regarding brain development and music, specifically rhythmic processing. My current research project allows me to integrate the two with the purpose of learning more about rhythmic development in children.

Career Goals and Plan: After graduating with a Bachelor of Science in biology, I plan to pursue a Ph.D. in Neuroscience, then complete translational post-doctoral training with emphasis in neurodevelopment. After achieving this, I plan to focus my research in child development, specifically in neurodevelopmental disorders. I am also interested in community outreach to bring awareness about atypical neurodevelopment. I believe my current research project will help me prepare for these goals because it combines my interest in child development and allows me to contribute as a classical musician and as a scientist.

ENDURE Summer Research Experience

Research Experience Institution: University of Puerto Rico, Rio Piedras

Research Mentor: Dr. Amaya Miquelajauregui-Graf

Project Title: From Random Noise to Music: An Investigation of Rhythm Universals in School-Age Children

Abstract: Our remarkable musical abilities seem to be rooted in biological principles and the inherent capacities of the human brain. Interestingly, music across cultures shares fundamental similarities or universalities. In a previous study using iterative chains, it has been shown that adult participants are able to turn random, computer-generated sequences into rhythmically structured patterns, and produce unique motifs within each chain. In the present study, we sought to understand the inherent ability of children to produce music by studying rhythmic perception and production using independent transmission chains. To achieve this, Puerto Rican children (7-9 years old) imitated drumming patterns using the same paradigm of iterative chains. Inter-onset intervals (IOI) were extracted from resulting chains and statistically analyzed to determine patterns of rhythm universals. In order to account for possible heterogeneity in psychomotor abilities, we also applied adapted psychomotor tests. By characterizing the emergence of rhythm universals in Hispanic children we expect to shed light on the maturation of music capabilities during brain development.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Raul Garcia-Rosario

Home Institution: University of Puerto Rico, Rio Piedras

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Cellular-Molecular Biology, 2020

Mentor at Home Institution: Dr. Jose García-Arrarás

Scientific Interests: I'm interested in neuroregeneration, neurodegeneration, and neurological disorders, and I want to work on the molecular mechanisms characterizing each one. I'm also interested in the translation of basic research findings on these areas of neuroscience into therapeutics for patients of neurological diseases.

Career Goals and Plan: It is my goal to pursue an M.D./Ph.D. in the fields of neurology and neuroscience, respectively. After finishing my biology major with an emphasis on cellular and molecular biology, my next step is to apply to Post-baccalaureate Research Education Programs (PREP) to get more research experience and to be a more competitive applicant for M.D./Ph.D. programs.

ENDURE Summer Research Experience

Research Experience Institution: Johns Hopkins University School of Medicine

Research Mentors: Dr. Ted Dawson, Dr. Valina Dawson

Project Title: Understanding Mitochondrial Dysfunction in Parkinson's Disease

Abstract: The primary cause of autosomal recessive Parkinson's disease results from mutations in Parkin, a ubiquitously expressed E3 ligase. Parkin has been shown to be a key regulator of mitochondrial quality control by facilitating transport, biogenesis, mitophagy, and fission/fusion dynamics. Historically, germline Parkin KO mice exhibit no motor deficits, neurodegeneration, or mitochondrial dysfunction. However, adult conditional Parkin KO mice display dopaminergic (DA) neurodegeneration with reduced mitochondrial number and mass. We have previously shown that loss of Parkin function results in an accumulation of PARIS (ZNF746), a transcription factor that is constitutively expressed at low levels in neurons and that translocates to the nucleus and suppresses transcription of PGC-1a, a master coregulator of mitochondrial biogenesis. Recently, a group found that crossing germline Parkin KO mice and mice harboring DNA Polγ mutations (Mutator mice), a known model of aging, resulted in 40% DA neurodegeneration and corresponding motor deficits. Our hypothesis was that knocking down PARIS in this model may rescue these effects. After extensive behavioral testing (pole test) and biochemical analysis (TH+ and Nissl+ Neurons counting), we have been unable to reproduce the previously published results. This could be due to several factors, including diet, environment, low number of animals used in the initial study, etc.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Jaysen A. Lara-Jiménez

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Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Cellular-Molecular Biology, 2021

Mentor at Home Institution: Dr. Alfredo Ghezzi

Scientific Interests: I'm interested in understanding the molecular mechanisms involved in alcohol addiction and its epigenetic effects at the transcriptional level. I want to create pharmacological therapies for alcohol use disorder patients using a cross-drug interaction between ketamine and alcohol in the N-methyl-D-aspartate receptor (NMDAR). I also want to comprehend other roles involved in this receptor such as aggressiveness, and how it is involved in within neurological functions.

Career Goals and Plan: My academic goal is to obtain an M.D./Ph.D. with a focus in neuroscience. A dual-degree in neuroscience will allow me to learn new methods to treat illnesses that are considered incurable. Specifically, I am interested in research in translational neuroscience that identifies the neuronal mechanisms of neurodegenerative diseases. My long-term plan is to study Alzheimer's disease because I am passionate about understanding how misfolded proteins attack the brain and their role in the progression of memory loss. Translational neuroscience will allow me to learn how to create the therapies of the future and apply them in a clinical setting.

ENDURE Summer Research Experience

Research Experience Institution: University of Puerto Rico, Rio Piedras

Research Mentor: Dr. Alfredo Ghezzi

Project Title: Defining the Role of NMDAR1 in Alcohol Use Disorders

Abstract: Alcohol addiction is defined as an increase in the desire to consume alcohol, accompanied by an impaired ability to stop or control use. Sustained exposure to alcohol leads to adaptations in the brain caused by changes in gene expression. This genetic plasticity is involved in the persistence of symptoms of alcohol use even after extended periods of abstinence and give rise to behavioral phenotypes collectively known as alcohol use disorder. The N-methyl-D-aspartate ionotropic receptor (NMDAR) interacts with the major excitatory amino acid called glutamate and possess many functional processes such as synaptic plasticity, learning and memory. Acute alcohol exposure inhibits the excitatory action of glutamate at NMDA receptors and blocks Brain-derived neurotrophic factor (BDNF) at post-synaptic levels, acting as an antagonist. In this study, we use a combination of behavioral and genetic analyses in a Drosophila model system to characterize the effect of NMDAR gene repression via RNA-interference (RNAi) on alcohol use disorders, including sleep disruption. We found that exposure to alcohol increased fly sleep and decreases locomotion in female flies. Additionally, mutant flies expressing an RNAi for the NR1 subunit of the NMDA receptor revealed an increase in locomotion in the fly female mutants when compared to the controls.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Kevin Nieves-Santos

Home Institution: Sacred Heart University of Puerto Rico

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Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Biology and Math, 2021

Mentor at Home Institution: Dr. Mark W. Miller

Scientific Interests: The goal of our lab is to localize glutamate-like immunoreactivity in the CNS of *Biomphalaria glabrata*. This animal model is a snail and it is the intermediate host for schistosomiasis, a disease also known as bilharzia, caused by the flatworm *Schistosoma mansoni*. The curious thing behind this snail is that after being infected by *S. mansoni*, it suffers a series of physiological changes such as an increase in metabolic rate, a decrease in velocity and parasitic castration. For these reasons, we aim to know if glutamate contributes to behaviors that are altered following infection.

Career Goals and Plan: I am determined to become a remarkable and fully prepared neuroscientist, capable of leading my own research for the benefit of society. I think, every medical advance begins under the coat of what we cannot see; reasons for which I will prepare myself to be intrepid, helpful and innovative throughout my professional and academic career.

ENDURE Summer Research Experience

Research Experience Institution: Michigan State University

Research Mentors: Dr. William D. Atchison, Dr. Yukun Yuan

Diversity Poster Session: Theme B: Neural Excitability, Synapses, and Glia, L-39

Project Title: The Effect of Acute Methylmercury (MeHg) Exposure on AMPA Receptor Expression in the Central Nervous System of Mouse

Abstract: This research focuses on understanding cell-selective neurotoxicity of the environmental contaminant methylmercury (MeHg). This metal has been causative of two major outbreaks of neurotoxicity and death- both resulting from consumption of contaminated food. It remains a contemporary concern, especially for pregnant and nursing women, due to the pronounced perinatal toxicity of MeHg. Our goal was to identify if changes in gene expression occur in the α-Amino-3-hydroxy-5-methyl-4-isoxazolepropionicacid receptors (AMPARs) after MeHg exposure in the central nervous system (CNS) including: the neocortex, brainstem, cerebellum and spinal cord.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Astrid Ramos

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Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Natural Science, 2021

Mentor at Home Institution: Dr. Carmen Maldonado-Vlaar

Scientific Interests: I currently study the neurobiological bases of anxiety and depression using preclinical behavioral models and tests with Sprague Dawley rats. We're interested in elucidating the role of oxytocin in regulating anxiety-like behaviors through its apparent crosstalk with the endocannabinoid system. Besides my current work, I'm interested in learning and eventually working with other conditions like depression and neurodegeneration, and the possible epigenetic mechanisms behind some of these.

Career Goals and Plan: First, I plan to graduate by December 2021 with my bachelor's degree in interdisciplinary sciences and immediately pursue a doctoral degree (Ph.D.) in neuroscience. As a graduate, I'd like to work within the field of behavioral neuroscience to study the neural bases of mental illnesses like depression.

ENDURE Summer Research Experience

Research Experience Institution: University of Puerto Rico, Rio Piedras

Research Mentor: Dr. Carmen Maldonado-Vlaar

Project Title: Depression and the Role of the Endocannabinoid System in the Brain

Abstract: In the lab, I currently work with the relation between the endocannabinoid system and depression in a doctoral student's theses project. We study the effects of using URB597 to inhibit fatty acid amide hydrolase (FAAH) on depression and anxiety. To do this, we used male rats and they receive intraperitoneal injections of URB597 or saline. One group received chronic injections and the other acute. After the injections, the rat's locomotor activity was assessed. Later, to evaluate anxiety-like behaviors, the rats were tested on the elevated plus-maze (EPM), and to evaluate the possible anti-depressive effects of the treatment we tested them in forced swim test (FST). In addition to the behavioral tests, we ran biochemical analysis to measure the expression of the TRPV1 and CB1 receptors.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Leonardo Ramos-Rodriguez

Home Institution: University of Puerto Rico, Rio Piedras

Email: leonardo.ramos4@upr.edu

Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Molecular Biology, 2020

Mentor at Home Institution: Dr. Alfredo Ghezzi

Scientific Interests: My interests are in understanding the genetics and epigenetic adaptations of the brain to addiction. As we understand more about the neuroscience of addiction the more it is evident that there are important genetic and epigenetic aspects that, as a whole, affect behavior and I am interested in understanding these mechanisms.

Career Goals and Plan: After entering and completing a graduate degree, I plan to continue in academia. My hope is to continue doing research as a career. My end goal would be to get a research faculty position at a university. Through this career path I would not only like to impact the field but to serve as a mentor for future scientists and by creating a space for personal and professional development.

ENDURE Summer Research Experience

Research Experience Institution: University of Pennsylvania

Research Mentor: Dr. John A. Dani

Diversity Poster Session: Theme G: Motivation and Emotion, 0-15

Project Title: Role of Tip60 Gene in Alcohol Tolerance in *Drosophila melanogaster*

Abstract: Alcohol tolerance is caused by a set of adaptations that occur in the brain once an organism has been exposed to the drug through epigenetic processes that alter chromatin structure and gene expression that lead to the development of tolerance. However, the overall epigenetic mechanisms that underly alcohol tolerance remain unknown. Our goal was to study the effect alcohol has on Tip60, a conserved gene that codes for a histone acetyltransferase (HAT) and regulates gene expression through the acetylation of H4 that has been found to occur after alcohol exposure. Using the UAS-Gal4 system, we knocked-down gene expression of Tip 60 in the whole fly brain and exposed these flies to ethanol for 12 days. We used sedation and recovery from sedation as proxies for alcohol tolerance. As a result, we found that flies with Tip60 gene KD could not create tolerance to alcohol compared with the control group that created tolerance.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Ángel Sirfa-López

Home Institution: Polytechnic University of Puerto Rico, San Juan

Email: angel.sirfa@upr.edu

Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Biomedical Engineering, 2020

Mentor at Home Institution: Dr. Jose García-Arrarás

Scientific Interests: My scientific interest is in areas such as neurological engineering, biological engineering and developmental biology. In the past year I have been working on mechanisms of regeneration in the sea cucumber and I have grown extremely interested in seeing such regeneration in human bodies. I also have been researching the effects of infrared light in neural bodies and the effect it has in neurogenesis. In the future I hope to further investigate the development of devices that can harness the power of infrared Light and stimulate different neural bodies.

Career Goals and Plan: My career goals consist of pursuing a Ph.D. in Biological Engineering and research further areas such as neurological disorders, medical device design, and signaling mechanisms in neural bodies. After completing my Ph.D. I plan to seek an M.D. in neurology. This will give me a clear vision into understanding patients conditions and also learn how brain disorders affect people differently. After finishing my studies, I plan to open a lab focused on the development of devices and investigating the human brain.

ENDURE Summer Research Experience

Research Experience Institution: University of Puerto Rico, Rio Piedras

Research Mentor: Dr. Jose García-Arrarás

Diversity Poster Session: Theme A: Development, L-19

Project Title: Characterization of Radial Nerve Cord In Vitro Explants of Sea Cucumber *Holothuria Glaberrima*

Abstract: The sea cucumber *Holothuria glaberrima* is a marine invertebrate with the capacity to regenerate its central nervous system (CNS). As an echinoderm, this organism is closely related to vertebrates. Its CNS is composed of an anterior circumoral nerve ring from which five radial nerve cords (RNC) extend posteriorly. The RNC are ganglionated nerves with neuronal somas in the periphery whose fibers form a neuropile in the center of the structure. Radial glia are interspersed among the neurons with elongations from the basal to apical ends. Unlike the mammalian CNS, this animal model is capable of undergoing a fast, efficient and scarless CNS regeneration following injury. We have developed an In-vitro system where we can determine cellular and molecular mechanisms of RNC regeneration. This system provides a better controlled environment for pharmacological and molecular studies. The RNC are dissected and treated with collagenase to separate them from the longitudinal muscle and body wall. They were placed in culture for a total of 11 days, and after we performed cryostat tissue sections to then study different molecular mechanisms and metabolic processes.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Yanilka Y. Soto-Muñiz

Home Institution: University of Puerto Rico, Rio Piedras

Email: yanilka.soto@upr.edu

Undergraduate Academic Level: Senior

Undergraduate Major and Expected Graduation Date: Molecular Biology, 2020

Mentors at Home Institution: Dr. Carmen Maldonado-Vlaar, Dr. Carlos Jiménez

Scientific Interests: My research interests are oriented towards neuropharmacology. I discovered my passion for neuroscience working with Dr. Carmen Maldonado-Vlaar, when we found that treating rats with the neuropeptide oxytocin can alter cocaine-induced behavior. Currently, I am developing a project in my home institution investigating with Dr. Carlos Jiménez, where our goal is to understand the neuroadaptations induced by cocaine.

Career Goals and Plan: Research, for me, is being at the border of the unknown, standing at the limits of what we know and having the opportunity of expanding that. I see myself in the future as an independent principal investigator in a research-intensive program. I identify with the goal of the ENDURE program of developing a diverse research workforce. Providing mentoring, funds, and opportunities to integrate minorities to research-related careers excites me about the future, as I can become a leader of this movement.

ENDURE Summer Research Experience

Research Experience Institution: University of California San Diego

Research Mentors: Dr. Victoria Risbrough, Jessica Deslauriers

Diversity Poster Session: Theme G: Motivation and Emotion, 0-20

Project Title: Drinking Behaviors in an Animal Model of Comorbid PTSD and AUD

Abstract: The comorbidity of post-traumatic stress (PTSD) and alcohol use disorder (AUD) is a phenomenon with high prevalence in the population. An animal model of comorbid PTSD/AUD has been developed in male mice. However, the relationship between alcohol use and PTSD risk in females remains unclear. We hypothesized that higher PTSD-like phenotype results in increased drinking behaviors. We used the predator stress model to induce PTSD-like behaviors in female mice. Stressed female mice were exposed to a cat and control mice were handled. At baseline and 2 and 4 weeks after stress, drinking behaviors (2 bottle-choice, drinking-in-the-dark test) and PTSD-like behaviors (open field, light-dark box, and trauma reminder tests) were assessed. The data revealed that susceptible mice maintain a PTSD-like behavior and increased their alcohol preference, opposite to the resilient mice. There was no significant difference in ethanol consumption (drinking- in-the-dark test) between the groups. These findings suggest that there must be a causal relationship between PTSD-like behavior and increasing alcohol consumption. This model will be critical for studying these diseases and testing treatments.

ENDURE TRAINEE INFORMATION & RESEARCH ABSTRACT

Viviana Valentín-Valentín

Home Institution: University of Puerto Rico, Rio Piedras

Email: viviana.valentin1@upr.edu

Undergraduate Academic Level: Junior

Undergraduate Major and Expected Graduation Date: Cellular-Molecular Biology, 2021

Mentor at Home Institution: Dr. Gregory Quirk

Scientific Interests: My current research interests involve studies in behavioral neuroscience focused on mammalian sexual interactions. More specifically, understanding the mechanisms involved in monogamous pairing.

Career Goals and Plan: Following the completion of my bachelor's degree in molecular and cellular biology, I plan on pursuing a neuroscience Ph.D. with a research focus on behavioral neuroscience. By having my own laboratory, I will be able to conduct independent research on mammalian innate behaviors. More importantly, my passion for educating people through the teachings I have obtained from various life experiences gives me confidence in my ability to become a vehicle for academic and professional development for future generations.

ENDURE Summer Research Experience

Research Experience Institution: University of Puerto Rico, Rio Piedras

Research Mentor: Dr. Gregory Quirk

Project Title: Optogenetic Assessment of Prelimbic, Striatal, and Amygdalar Circuits in Active Avoidance

Abstract: Individuals who suffer from post-traumatic stress disorder (PTSD) exhibit persistent avoidance. Although avoidance can be useful for adaptively responding to a threat, excessive avoidance comes at a cost when interfering with goal-directed behaviors. To understand the circuitry of avoidance, we developed a task where rats learn to avoid a tone-signaled shock by stepping onto a platform. Our lab showed that activity in prelimbic cortex (PL), basolateral amygdala (BLA), and ventral striatum (VS) is necessary for avoidance. We were thus interested in which PL projections drove avoidance using optogenetics. Photoactivating PL-VS projections impaired avoidance, whereas photosilencing PL-VS projections did not. In addition, photoactivating PL-BLA projections accelerated avoidance, but photosilencing PL-BLA projections impaired avoidance. These findings suggest that different PL targets have opposing effects on avoidance, consistent with immunohistochemical findings showing that avoidance retrieval activates PL-BLA, not PL-VS, projections. Finally, previous studies have shown that BLA-VS projections are necessary for shuttle avoidance, so we were interested in whether this was also true for platform avoidance. Photosilencing BLA-VS projections impaired avoidance, suggesting that this projection is also key to platform avoidance. Taken together, the coordination of PL and BLA inputs to VS guides the optimal expression of active avoidance.

RECRUITMENT FAIR PARTICIPANTS

UNIVERSITY/SCHOOL	Program Representative(s)
BRANDEIS UNIVERSITY	**Eve Marder, Ph.D.** Professor of Biology
BROWN UNIVERSITY	**Anne C. Hart, Ph.D.** Director, Neuroscience Graduate Program **Diane Lipscombe, Ph.D.** Director, Carney Institute for Brain Science **David Sheinberg, Ph.D.** Professor of Neuroscience
COLUMBIA UNIVERSITY	**Darcy B. Kelly, Ph.D.** Co-Director, Doctoral Program in Neurobiology and Behavior
EMORY UNIVERSITY	**Yolanda Smith, Ph.D.** Director, Neuroscience Graduate Program
GEORGETOWN UNIVERSITY	**Ludise Malkova, Ph.D.** Professor of Pharmacology **William Rebeck, Ph.D.** Professor of Neuroscience
HARVARD MEDICAL SCHOOL	**Isle Bastille** Student, Ph.D. Program in Neuroscience **Corey Harwell, Ph.D.** Assistant Professor of Neurobiology **Busula Olukoya** Student, Ph.D. Program in Neuroscience **Rosalind Segal, Ph.D.** Director, Ph.D. Program in Neuroscience **Taralyn Tan, Ph.D.** Education Programing Director, Program in Neuroscience
ICAHN SCHOOL OF MEDICINE AT MOUNT SINAI	**George Huntley, Ph.D.** Director, Ph.D. in Neuroscience Program
JOHNS HOPKINS UNIVERSITY	**Christopher R. Fetsch, Ph.D.** Assistant Professor of Neuroscience
NEW YORK UNIVERSITY	**Heather McKellar, Ph.D.** Executive Director, Neuroscience Institute **Bernardo Rudy, Ph.D.** Professor of Neuroscience Institute **Rachel Weintraub-Brevda, Ph.D.** Senior Program Coordinator, Neuroscience Institute

OREGON HEALTH & SCIENCE UNIVERSITY	**Kelly Monk, Ph.D.** Co-Director, Vollum Neuroscience Graduate Program **Gary Westbrook, M.D.** Senior Scientist, Vollum Institute
PRINCETON UNIVERSITY	**Paula Brooks** Graduate Student, Neuroscience Institute **Edwin Clayton, PhD** Senior Project Manager, Neuroscience Institute **Jorge Iravedra Garcia** Graduate Student, Neuroscience Institute ENDURE Alumnus **Kenneth Norman, Ph.D.** Chair, Department of Psychology
TEMPLE UNIVERSITY	**Lisa Briand, Ph.D.** Associate Director, Master's Program in Neuroscience **Ellen Unterwald, Ph.D.** Director, Center for Substance Abuse Research
UNIVERSITY OF CALIFORNIA, BERKELEY	**Dan Feldman, Ph.D.** Associate Professor of Neurobiology **Michael Silver, PhD** Professor of Vision Science, Optometry and Neuroscience
UNIVERSITY OF CALIFORNIA, DAVIS	**Najwa Marrush** Neuroscience Graduate Coordinator, Center for Neuroscience **W. Martin Usrey, Ph.D.** Chair, Department of Neurobiology, Physiology and Behavior
UNIVERSITY OF CALIFORNIA SAN DIEGO	**Ryan Golden** Student, Neuroscience Graduate Program **Jessica Haley** Student, Neuroscience Graduate Program **Maribel Patino** Student, Medical Scientist Training Program
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS	**Diego Restrepo, Ph.D.** Co-Director, Center for NeuroScience **Sukumar Vijayaraghavan, Ph.D.** Director, Neuroscience Graduate Program
UNIVERSITY OF IOWA	**C. Andrew Frank, Ph.D.** Recruitment and Admissions Chair, Neuroscience Graduate Program **Marco Pipoly** Student, Neuroscience Graduate Program ENDURE Alumnus

UNIVERSITY OF MARYLAND SCHOOL OF MEDICINE	**Mary Kay Lobo, Ph.D.** Associate Professor of Anatomy and Neurobiology **Margaret M. McCarthy, Ph.D.** Director, Graduate Program in Neuroscience **Jessica Mong, Ph.D.** Director of Graduate Education, Graduate Program in Neuroscience **Georgia Rogers, Ph.D.** Academic Services Specialist, Graduate Program in Neuroscience
UNIVERSITY OF MICHIGAN	**Richard Altschuler, Ph.D.** Professor of Otorhinolaryngology **Sara Aton, Ph.D.** Associate Director, Neuroscience Graduate Program **Audrey Seasholtz, Ph.D.** Associate Director, Neuroscience Graduate Program **Leslie Satin, Ph.D.** Professor of Pharmacology
UNIVERSITY OF MINNESOTA	**A. David Redish, Ph.D.** Distinguished McKnight University Professor, Department of Neuroscience **Linda McLoon, Ph.D.** Director, Neuroscience Graduate Program
UNIVERSITY OF PENNSYLVANIA	**Christine Clay** Coordinator, Neuroscience Graduate Group
UNIVERSITY OF SOUTHERN CALIFORNIA	**Jason Zevin, Ph.D.** Director, Neuroscience Graduate Program
UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER SAN ANTONIO	**David Morilak, Ph.D.** Director, Neuroscience Graduate Program
UNIVERSITY OF UTAH	**Jim Heys, Ph.D.** Graduate Student Recruitment Chair, Neuroscience Program
UNIVERSITY OF WASHINGTON	**Paul E. M. Phillips, Ph.D.** Director, Neuroscience Graduate Program
VANDERBILT UNIVERSITY	**Lisa Monteggia, Ph.D.** Director, Vanderbilt Brain Institute **Danny G. Winder, Ph.D.** Co-Director, Neuroscience Training Program
WAKE FOREST SCHOOL OF MEDICINE	**Christos Constantinidis, Ph.D.** Associate Director, Graduate Program in Neuroscience **Carol Milligan, Ph.D.** Director, Graduate Program in Neuroscience

WASHINGTON UNIVERSITY IN ST. LOUIS	**Tamara Hershey, Ph.D.** Co-Director, Neuroscience Ph.D. Program **Erik Herzog, Ph.D.** Director, St. Louis Neuroscience Pipeline (ENDURE) **Timothy E. Holy, Ph.D.** Co-Director, Neuroscience Ph.D. Program **Sally Vogt** Program Coordinator, Neuroscience Ph.D. Program
YALE UNIVERSITY	**Charles A. Greer, Ph.D.** Director, Neuroscience Graduate Program

RECRUITMENT FAIR PROGRAM SUMMARIES

Brandeis University

Program Representative: Eve Marder, Ph.D.

https://www.brandeis.edu/neuroscience/

Brandeis is a unique research environment in which a major research university is embedded within a small and intimate liberal arts college; this allows for a level of personal interaction with faculty that is difficult to achieve at larger institutions. The smaller nature of the program fosters interdisciplinary and collaborative research between neuroscience laboratories and labs in other programs, which students value as part of their broad science education. The Interdepartmental Neuroscience graduate program at Brandeis comprises a comprehensive training program designed to give the next generation of outstanding neuroscientists the cognitive and technical skills they need to make important breakthroughs in understanding nervous system function and health. Our program is characterized by a diverse and highly collaborative set of internationally renowned faculty, with research programs that incorporate all the major subdisciplines of the field. Collaboration is part of the air we breathe: being a vibrant program embedded in a small and intimate research university naturally encourages interactions across model systems and at the interfaces between disciplines. During laboratory rotations students are encouraged to explore intellectual frameworks and acquire a range of skills, and throughout their Ph.D. will interact with and receive mentoring from a diverse group of faculty, as well as near-peer mentoring from a strong cohort of interdisciplinary graduate students and postdocs. Our trainees are highly successful in a range of pursuits after graduation, including academic and industrial science, science policy, and science communication.

Brown University

Program Representatives: Anne C. Hart, Ph.D.; Diane Lipscombe, Ph.D.; David Sheinberg, Ph.D.

http://neuroscience.brown.edu/graduate/

The Neuroscience Graduate Program and the faculty at Brown University are deeply committed to graduate student scholarship and research training. We promote interdisciplinary research that crosses traditional disciplinary and departmental boundaries, while providing a strong foundation in the core concepts of neuroscience. Research in the program employs an impressive array of the most current techniques and encompasses multiple levels of investigation from genes, molecules, and cells to neural networks, systems, computation, and behavior. Brown University graduate training in neuroscience is supported by numerous funding sources to ensure that students have guaranteed support throughout their studies. Integral to our program is an advising structure that ensures each student has an opportunity to chart their own graduate course with appropriate guidance and support. We offer exceptional courses taught by exceptional faculty that integrate lectures, discussions, critical analyses, statistical rigor, computer programming, and hands on experience with various research methods. Beyond our courses and research training, the graduate program offers numerous opportunities to learn skills essential for a successful career including teaching, grant writing, and interviewing. The neuroscience community at Brown is vibrant and collegial, and Brown University is also the home of the Robert J. Carney and Nancy D. Carney Institute for Brain Science. Students benefit from the resources offered by the Carney Institute including workshops focused on training in new research methodologies and computational approaches of relevance to the field of neuroscience. Brown University is a unique community that offers outstanding scholarship and research in a highly collaborative environment that is committed to societal impact and scientific excellence. (Fee waiver available upon request.)

Columbia University

Program Representative: Darcy B. Kelley, Ph.D.

http://www.neuroscience**Ph.D.**.columbia.edu/

We offer a diverse set of research and academic experiences that reflect the interdisciplinary nature of neuroscience. Over one hundred faculty from two campuses combine coursework and experiential learning in basic, clinical and translational science, providing an exceptionally broadly-based education. We also foster an atmosphere of collaboration between investigators, theorists, and experimentalists, where students learn the value of a problem-oriented approach to research. Neuroscience faculty members work with students to nurture and encourage development as independent scientists. Program directors closely advise students on choosing research mentors and courses. Students are encouraged to develop a flexible, multidisciplinary approach to research and collaboration between investigators with different areas of expertise is common. This helps students readily adapt to new research methodologies and opportunities throughout their careers. Students in the program can select a thesis topic from virtually any area of basic or translational neuroscience. While the Doctoral Program in Neurobiology and Behavior focuses primarily on problems in basic biological sciences, close association with clinical researchers creates an atmosphere in which students are encouraged to consider the implications of their research for understanding the neurobiology of disease. Clinically relevant research topics cover the spectrum of animal models for human disease.

Emory University

Program Representative: Yoland Smith, Ph.D.

http://www.biomed.emory.edu/PROGRAM_SITES/NS/

The Emory Graduate Program in Neuroscience provides the multidisciplinary training in basic and disease-related neuroscience research leading to the Ph.D. degree. This training provides the breadth of knowledge and research skills in modern systems and integrative neuroscience required for successful careers in biomedical research, education, and industry. Because of the successful integration of faculty from clinical and basic science departments, Ph.D. students in the Emory graduate neuroscience program benefit from a unique environment to build, develop and successfully achieve a graduate training in translational research that spans from genes and molecules to disease-related research and clinical care of neurological and psychiatric brain disorders. Through a rigorous series of courses and laboratory rotations during the first two years of training, the program also allows the student to learn currently accepted scientific facts and theories; learn to plan, conduct and critically evaluate experiments; make an original contribution to scientific knowledge; become skilled in oral and written communication; and become self-sufficient in continuing education beyond graduate school. The program also prepares the student to teach neuroscience and related disciplines in professional and graduate schools. We have just completed our 21st year of training grant support.

Georgetown University

Program Representatives: Ludise Malkova, Ph.D.; William Rebeck, Ph.D.

https://neuroscience.georgetown.edu/

The Interdisciplinary Program in Neuroscience (IPN) is highly ranked in the National Research Council's latest rankings of U.S. graduate programs in Neuroscience. Currently, we have about 50 PhD students investigating topics ranging from glial activation, neuron signaling, and dendritic spine plasticity, to mechanisms of Parkinson's disease, Alzheimer's disease, and traumatic brain injury, to systems of face recognition, word reading, and interpretation of sounds. With 71 faculty members drawn from 14 different departments at Georgetown University and neighboring institutions, we have strong programs in neurodegeneration, examining molecular mechanisms of pathogenic processes, and cognitive neuroscience, investigating development, language, memory, social interactions, and impairments of these systems. A specific training program is available for those students interested in neural injury and plasticity and translational biomedical science. It is also possible for our students to apply for a concentration in cognitive science. Our Ph.D. students actively participate in organizing our program and teaching courses, and they have an excellent record of publishing manuscripts and receiving grants. Georgetown University also offers a one-year M.S. program in Integrative Neuroscience, providing students with a comprehensive neuroscience education within specific academic tracks. Our mission is to educate women and men to be excellent neuroscientists, lifelong learners, and responsible, active participants in the global scientific

community. The success of our alumni in diverse scientific career paths gives us great pride and demonstrates their commitment to be stewards of the discipline of neuroscience while living generously in service to the community.

Harvard University Medical School

Program Representatives: Isle Bastille; Corey Harwell, Ph.D.; Busola Olukoya; Rosalind Segal, Ph.D.; Taralyn Tan, Ph.D.

http://dms.hms.harvard.edu/neuroscience/

The Harvard Ph.D. Program in Neuroscience, known as PiN, spans the neuroscience community throughout Harvard University. The Program provides mentoring and advising to a close and supportive community of students who carry out Ph.D. thesis research in laboratories in the Harvard Medical School Neurobiology department, in Harvard-affiliated Hospitals, or in the Faculty of Arts and Sciences. Program students come from diverse scientific, personal and cultural backgrounds. More than 130 faculty members provide exciting and rigorous research training in all areas of neuroscience, and our 100+ students take full advantage of these opportunities. We are dedicated to educating students so they develop as neuroscientists who will change science in the 21st Century and beyond. PiN provides training for neuroscience careers including academic research, science policy, biotech, pharmaceuticals, consulting, K-12 education, community education, science writing and outreach, “big data,” and other developing fields. Attending graduate school at the Harvard Program in Neuroscience is a wonderful and inspiring experience. We welcome your application!

Icahn School of Medicine at Mount Sinai

Program Representative: George Huntley, Ph.D.

https://icahn.mssm.edu/education/Ph.D./neuroscience

Our Neuroscience graduate program provides rigorous, multidisciplinary and highly collaborative training that emphasizes translational and transformative discoveries about the molecules, cells, circuits and behaviors that constitute nervous system function in health and disease. Here you will find a world-class faculty spanning multiple Departments, Institutes and Centers who investigate brain structure and function in a variety of model systems (e.g. worms, flies, rodents, non-human primates), as well as the human brain itself, using sophisticated approaches that are at the forefront of technological and conceptual advances. Our curriculum combines didactic coursework (including a course with direct patient contact) with the freedom to customize your learning experience both in the laboratory and through a wide choice of advanced elective courses. Electives are offered by departments, institutes, centers and other training areas throughout the Institution. Our program leverages the close partnership between the Icahn School of Medicine and the Mount Sinai Health System hospitals to provide an extraordinary diversity of scientific and clinical strengths, fostered by close synergy across Departments, Centers and Institutes, including Neuroscience, The Friedman Brain Institute, The Brain Imaging Center, Psychiatry, Neurology, Genetics and Genomic Sciences, The Institute for Genetics and Multiscale Biology, Geriatrics, Neurosurgery, Pharmacology and Systems Therapeutics, the Black Family Stem Cell Institute, Rehabilitation Medicine and others.

Johns Hopkins University School of Medicine

Program Representative: Christopher R. Fetsch, Ph.D.

http://neuroscience.jhu.edu/

The Neuroscience Training Program and the Neuroscience Department were among the first neuroscience-focused academic centers established in the United States, dating back to 1980. Our faculty have trained over 250 Ph.D. and M.D./Ph.D. students and 500 postdoctoral fellows in just the past ten years, partnerships that have led to fundamental discoveries in the organization of the cerebral cortex, neurotransmitter signaling, neuronal and glial cell development, and circuit function. Our students represent the brightest young scientific minds, and many have shown an early commitment to research.

Because they enter our Program with different backgrounds, and the laboratories in which they choose to work are so diverse, our program is designed to be flexible. All doctoral candidates receive full tuition remission and a stipend for the duration of their studies. Currently, 177 doctoral candidates and 200 postdoctoral fellows work in the faculty laboratories, creating a diverse community that fosters development of novel approaches to answer complex questions. The goal of the Program is to ensure that our students obtain broad training in the neurosciences. Our curriculum spans the breadth of modern neuroscience, from molecular/cellular underpinnings to systems/cognitive integration and offers a rich training experience that brings students to the forefront of research in their particular area of interest, in preparation for a rewarding, independent career in the sciences.

New York University

Program Representatives: Heather McKellar, Ph.D.; Bernardo Rudy, Ph.D.; Rachel Weintraub-Brevda, Ph.D.

http://www.neuroscience.nyu.edu/

Neuroscience education at NYU has a decades-long history of excellence and strength. Historically focused in two separate doctoral programs, the Doctoral Program in Neural Science (Faculty of Arts and Science) and the Doctoral Program in Neuroscience & Physiology (Sackler Institute, School of Medicine), neuroscience education is now harmonized and engages faculty across multiple departments, inter-disciplinary centers, and campuses. Students receive a comprehensive, interdisciplinary neuroscience education, and they have the opportunity to sample different research experiences before they commit to a topic area and laboratory. Training strongly emphasizes research at the highest level throughout graduate school. Students also benefit directly from an interactive, collegial community and become active participants in shaping the rich, intellectual environment that complements their formal training.

Oregon Health and Science University

Program Representative(s): Kelly Monk, Ph.D.; Gary L. Westbrook, M.D.

https://www.ohsu.edu/school-of-medicine/neuroscience-graduate-program

The Neuroscience Graduate Program (NGP) at OHSU aims to train predoctoral students in modern neuroscience concepts and techniques. The large faculty (140+ strong) has expertise in all areas of neuroscience, including molecular, cellular, systems, developmental, and medical neuroscience. The core curriculum is concentrated in the Fall term of the first year, permitting students to focus on the essence of graduate training—full time research rotations followed by independent research in a mentor's laboratory—as soon as possible. NGP students at OHSU conduct research in all areas of neuroscience and earn the Ph.D. degree after an average of 5 years. New students arriving at OHSU are quickly integrated into the program through our new weeklong 'boot camp' in neuroscience methods, and the annual NGP retreat, both of which precede beginning of fall classes. As time spent in the lab is the most important component of graduate science training, our program is designed such that core coursework is completed in the first year. During that first year, students also are immersed in research through lab rotations in several labs, eventually choosing one that gives a mutual fit. Because of the relatively small number of students compared to the number of neuroscience laboratories at OHSU, students have many options for a thesis lab. Our well-funded faculty provide state-of-the-art exposure to the concepts and technology of modern neuroscience.

Princeton University

Program Representatives: Paula Brooks; Edwin Clayton, Ph.D.; Jorge Iravedra Garcia; Kenneth Norman, Ph.D.

https://pni.princeton.edu/

At Princeton University, faculty with research interests in neuroscience can be found in many departments, including Applied Math, Chemistry, Computer Science, Engineering, Molecular Biology, Physics, Philosophy and Psychology. This diversity mirrors the interdisciplinary nature of contemporary neuroscience research and provides a rich set of opportunities for research and training in neuroscience. How do millions of

individual neurons work together to give rise to behavior at the level of a whole organism? How do our brains work? Training researchers to answer these fundamental, unanswered questions is the goal of the Princeton Neuroscience Institute graduate program. Students in this program learn to use the latest techniques and approaches in neuroscience and are trained how to think and how to develop new techniques and approaches. Creativity and originality in research are essential to cracking the puzzle of the brain. Ph.D. Neuroscience students take lecture and laboratory courses; learn to read, understand, and present current scientific literature; develop and carry out substantial original research, and present their research at meetings and conferences, including the annual Neuroscience retreat each Spring.

Temple University

Program Representatives: Lisa Briand, Ph.D.; Ellen Unterwald, Ph.D.

http://www.temple.edu/neuroscience/

Temple scientists are at the forefront of research and teaching in the rapidly expanding world of neuroscience. We support an interdisciplinary approach to this exciting field of study, with our neuroscience programs spanning multiple Schools, Colleges, and research centers. The College of Liberal Arts Neuroscience Program offers a neuroscience degree program that teaches students to explore neural and brain function at multiple levels in a rapidly growing field. These students study the neural basis of addiction, developmental disorders, ADHD, depression, anxiety, age-related disorders and much more. The Neuroscience Cluster at the Lewis Katz School of Medicine is an educational working group, supporting Ph.D., M.D./Ph.D., and M.S. educational/research programs within Lewis Katz School of Medicine at Temple University's Biomedical Sciences Graduate Program. This cluster provides thematic courses, research opportunities, and educational activities related to neuroscience, bringing together faculty members from basic science and clinical departments, as well as research centers—Center for Substance Abuse Research, Center for Neurovirology and Comprehensive NeuroAIDS Center, Shriner's Hospitals Pediatric Research Center and the Alzheimer's Center at Temple. The Neuroscience Cluster offers graduate students exposure to a number of areas of basic neuroscience research and education with the goal of translating basic research advances into treatments for neurological and neuropsychiatric disorders. Indeed, the breadth and depth of the faculty members encourages an interdisciplinary approach to neuroscience education and research.

University of California, Berkeley

Program Representatives: Dan Feldman, Ph.D.; Michael Silver, Ph.D.

http://neuroscience.berkeley.edu/

UC Berkeley has a vibrant neuroscience research and training community covering all aspects of neuroscience, with an emphasis on multidisciplinary research. The Helen Wills Neuroscience Institute at UC Berkeley includes 70 faculty members in 12 academic departments, talented and creative graduate student and postdoctoral researchers, dedicated staff, and cutting-edge research and technology centers. Together, we harness Berkeley's world-class strengths to build next-generation experimental, analytical, and theoretical approaches to probe brain function, development, aging, and disease. Our Neuroscience PhD Program offers intensive training in neuroscience research through a combination of coursework, research training, mentoring, and professional development. Our faculty provide broad expertise from molecular and cellular neuroscience to circuit, systems and computational neuroscience, to human cognitive neuroscience. A unique feature of the neuroscience training at Berkeley is the highly multidisciplinary research environment. For instance, Neuroscientists work side-by-side in the lab with engineers and roboticists to study motor control, with bioengineers to grow stem cells for regenerative medicine and tissue engineering, and with chemists to develop new reagents for optical monitoring and control of neural activity. Neuroscience Program students are trained at these intersections between fields and help drive fundamental scientific and technological advances.

University of California, Davis

Program Representative: W. Martin Usrey, Ph.D.

https://neuroscience.ucdavis.edu/

The UC Davis Center for Neuroscience is dedicated to understanding brain function in health and in illness. Our teams of internationally recognized scientists study areas, ranging from cellular and molecular neurobiology, through systems and developmental neuroscience, to studies of human perception, attention, memory, language, and the nature of consciousness. Their discoveries provide the raw material and building blocks that translate into advances in the clinic through close collaboration between bench scientists and physicians. In addition to discovery-driven research, the Center for Neuroscience is home to three premier NIH T32 training programs for graduate and postdoctoral researchers. The Neuroscience Graduate Program provides students with unparalleled opportunities for research at the cutting edge of neuroscience. The Neuroscience Graduate Group, one of the premier training programs in the United States, offers a comprehensive program of courses and outstanding research opportunities leading to M.S. and Ph.D. degrees, and it participates in joint Physician and Veterinary Scientist Training Programs. The group is composed of over 80 faculty members drawn from 20 departments, divisions and sections, including the School of Medicine, the School of Veterinary Medicine, the College of Biological Sciences, the College of Agriculture and Environmental Sciences and the College of Letters and Sciences.

University of California San Diego

Program Representatives: Ryan Golden; Jessica Haley; Maribel Patino

http://neurograd.ucsd.edu/

The Neurosciences Graduate Program at the University of California, San Diego, together with our participating institutions, offers an outstanding opportunity for graduate training in one of the most highly interactive scientific environments available in the United States. Our graduate program is ranked fourth in the country by the National Research Council of the National Academy of Sciences. The Neurosciences Graduate Program currently includes more than 130 faculty. There are approximately 70 graduate students and over 60 postdoctoral scholars. The common purpose of all the participants in the Neurosciences Graduate Program is to foster and maintain a community of excellence in study and research in neuroscience, and to develop creative and innovative scientific research that leads to productive and successful careers. Students interested in clinically relevant research may want to explore the Med-into-Grad program, which provides clinical training to graduate students. The faculty who participate in the Neurosciences Graduate Program represent many UCSD departments: School of Medicine/Department of Neurosciences, Division of Biological Sciences/Neurobiology section, Department of Psychology, Cognitive Science/Cognitive Neuroscience, and several affiliated institutions, including: Salk Institute for Biological Studies, Sanford Burnham Institute, Scripps Institution of Oceanography, Scripps Research Institute, and the V.A. Medical Center.

University of Colorado Anschutz Medical Campus

Program Representatives: Diego Restrepo, Ph.D.; Sukumar Vijayaraghavan, Ph.D.

http://medschool.ucdenver.edu/neuroscience

The Neuroscience Training Program at the CU School of Medicine provides multidisciplinary training covering the breadth of neurobiology, from neuronal gene regulation to the development, structure, and function of the nervous system. Students receive training in cellular and molecular neurobiology, neural development, neuropharmacology, and biochemistry, as well as hands-on training in a variety of state-of-the-art laboratory techniques. We are a program with diverse faculty spanning most areas of modern neuroscience. Through rigorous training and mentoring the program aims at graduating neuroscientists who are critical thinkers and poised for success in any endeavor of their choosing. Some of the features of the program include: (1) An extremely collaborative group of faculty, many of whom have joint grants, and often these collaborations are initiated by students; (2) being the recipient, since 2000, of the Jointly Sponsored Institutional Predoctoral Training Grant, one of the 28 institutions to receive the award; (3) a convivial and close knit group of students who are actively involved in all aspects of program governance,

with more than half of NSP students obtaining individual fellowships from NIH or NSF; (4) a rigorous coursework spanning cellular, systems, developmental, and quantitative neuroscience, and opportunities to take a grant writing course, biostatistics, and a number of electives in neuroscience; (5) a robust seminar series; (6) a student run journal club held in the presence of senior authors of the papers being discussed; and (7) a fun annual Program Retreat at the Stanley Hotel in Estes Park. We also have an active Outreach program, where NSP students collaborate with local schools, colleges, and the Denver Museum of Nature and Science.

University of Iowa

Program Representatives: C. Andrew Frank, Ph.D.; Marco Pipoly

https://neuroscience.grad.uiowa.edu/

The University of Iowa has a long tradition as a leading center for study of the nervous system and behavior, and for the training of graduate students in this area. Building on this foundation, the Neuroscience Graduate Program, established in 1984, formalizes the long-standing, interdisciplinary commitment of a diverse faculty. The program promotes interaction among faculty, postdoctoral fellows, and graduate students, and fosters a congenial and collaborative environment for investigating the structure and function of the nervous system and its role in determining behavior. The curriculum is designed to provide a multidisciplinary foundation in the conceptual and methodological approaches to study of the nervous system, emphasizing original, independent student research. The Neuroscience Program at the University of Iowa offers broad research opportunities. The curriculum for the Neuroscience Program is designed around a two-track system. Specifically, students can select and specialize in one of two offered tracks: molecular/cellular or cognitive/behavioral. Opportunities are available for students to organize and present lectures and seminars and assist in laboratory instruction of undergraduate and health professions students. With a Neuroscience degree from the University of Iowa your venues for the future are wide open. Whether you decide to go into academia, a research institute, or industry, the background you will receive from our program will have you fully prepared. Most of our Ph.D. students pursue a post-doctoral training position after the completion of their studies with us. Afterwards, our graduates pursue careers that often place them in academia. Whatever you decide, when your time with us nears an end, you will find yourself in the center of a large number of options.

University of Maryland School of Medicine

Program Representatives: Mary Kay Lobo, Ph.D.; Margaret M. McCarthy, Ph.D.; Jessica Mong, Ph.D.; Georgia Rogers, Ph.D.

http://lifesciences.umaryland.edu/Neuroscience/

The Program in Neuroscience (PIN) at the University of Maryland, Baltimore comprises over 100 research scientists, 45 graduate students and over 70 postdoctoral fellows in the Medical, Dental, Nursing and Pharmacy Schools, and the Maryland Psychiatric Research Center. As a doctoral degree-granting program, a major mission of the PIN is to prepare its graduate students with the training necessary to pursue successful careers as neuroscientists in academic, industrial and governmental settings. Faculty, postdoc and student investigators utilize a wide variety of state-of-the-art approaches to investigate topics whose scope ranges from single molecules to the functioning human brain. The Graduate Program in Neuroscience is dedicated to providing a center of excellence for the training of outstanding graduate students in the field of Neuroscience. Our Graduate Program is an interdisciplinary program of study leading to a Ph.D. degree in Neuroscience. We look to prepare the next generation of scientists who will advance our understanding of the brain/nervous system. Neuroscience faculty expertise and research interests range from the genome to the clinic. Our program enhances interaction among our internationally renowned faculty and enables graduate students to take advantage of the full depth and breadth of neuroscience research conducted at the University of Maryland School of Medicine. Our Ph.D. students are highly sought after, routinely being appointed as postdoctoral fellows at prestigious institutions. Our mission is to enhance and maintain our productive, competitive and highly funded research programs and to provide a center of excellence for the integrative training and development of outstanding students, postdoctoral fellows and faculty. Tackling these fundamental issues in neuroscience requires a

collaborative effort from researchers with similar interests and goals, as well as between researchers in diverse areas of neuroscience. A major strength of our program is the broad array of research areas represented, as well as the way these areas are integrated in collaborations among our faculty.

University of Michigan

Program Representatives: Richard Altschuler, Ph.D.; Sara Aton, Ph.D.; Leslie Satin, Ph.D.; Audrey Seasholtz, Ph.D.

http://neuroscience.med.umich.edu/

The University of Michigan Neuroscience Graduate Program (NGP) is a collegial, diverse, and interactive group of students and faculty that work across the breadth of the neuroscience field. The NGP focuses on excellence in education and training of our 75 Ph.D. students, encompassing the complete spectrum of neuroscience training and research and incorporating the full range of multidisciplinary techniques in an integrative and supportive environment. The NGP program captures the excitement and interdisciplinary collaboration intrinsic to the field of neuroscience by drawing on the expertise of over 155 faculty members from more than 29 departments. The NGP at the University of Michigan was constituted in 1971, making this the longest-standing neuroscience graduate program in the United States. The Neuroscience graduate students form a cohesive group that promotes the interactions among the faculty, making the NGP the nexus of the neuroscience community on campus. Graduates receive a Ph.D. in Neuroscience that provides tremendous flexibility in choosing one's career path. There are more than 205 alumni of our Program, and these graduates work in many different areas including academic research, industrial research and development, academic medicine and biotechnology. Our goal is to facilitate training of the future leaders in the field of neuroscience and to develop students that compete successfully in the scientific marketplace.

University of Minnesota

Program Representatives: Linda McLoon, Ph.D.; A. David Redish, Ph.D.

http://www.neuroscience.umn.edu/

The Graduate Program in Neuroscience (GPN) at the University of Minnesota is a large interdisciplinary Ph.D. program, made up of over 125 faculty members from all parts of the University of Minnesota, 30 departments from 10 colleges. Our goal is to provide students with a broad and deep understanding of Neuroscience, ranging from the molecular and genetic level to computational. Due to its interdisciplinary nature, our program is a highly collaborative and collegial environment in which to train. We have a productive and engaged faculty, committed to providing a supportive environment so that students can achieve their full potential. Our faculty are from 30 different departments and have a wide range of research interests and expertise. The complexity of research necessitates a multidisciplinary approach and a collaborative environment to be successful. We strive to provide this type of experience to all our trainees. We take training Ph.D. students very seriously, not only working to ensure they do great neuroscience research but building leadership capacity by involving students in all parts of program governance, increasing our Career Facilitation efforts [all our alumni outcomes are on our web page], and building an interactive community of scholars. We would love to have you join us!

University of Pennsylvania

Program Representative: Christine Clay

https://www.med.upenn.edu/ngg/

The Neuroscience Graduate Group (NGG) is the University of Pennsylvania's interdisciplinary Ph.D. program in neuroscience. The NGG is part of Biomedical Graduate Studies (BGS), an umbrella organization administered through the Perelman School of Medicine that includes the NGG and other biomedical-related graduate groups. The NGG is a collaborative and interdisciplinary Ph.D. program that provides training for careers in neuroscience research, teaching and more. Our training program is designed to provide a strong foundation of neuroscience knowledge while at the same time taking into account each

student's strengths, needs and career goals. The NGG is closely affiliated with the Mahoney Institute for Neurosciences (MINS) and the Penn Medicine Translational Neuroscience Center (PTNC). We have over 150 active faculty doing cutting-edge research in a broad range of fields including Computational, Systems, Cellular and Molecular, Developmental, and Behavioral and Cognitive Neuroscience, as well as Neurobiology of Disease and more. NGG students conduct research in a wide variety of fields and go on to careers in research, teaching, the public sector, and more. The NGG is committed to its mission of selecting and training top students from a diversity of educational and personal backgrounds. Because of the interdisciplinary nature of neuroscience, our admissions committee is not looking for a particular set of skills or educational path. Instead, we value highly motivated and talented students who have demonstrated an ability to thrive in a cutting-edge, research- oriented field. We welcome applications from all qualified individuals, particularly from members of ethnic, cultural, educational, and socioeconomic groups that are traditionally underrepresented in neuroscience.

University of Southern California

Program Representative: Jason Zevin, Ph.D.

https://ngp.usc.edu/

The USC Neuroscience Graduate Program (NGP) is the largest and only university-wide Ph.D. program at USC. A NIH-designated T32 Neuroscience Training Program, NGP students and faculty come from a variety of academic backgrounds to study questions spanning the spectrum of modern neuroscience research. Departing from the traditional focus on individual disciplines, USC Neuroscience is characterized by collaborative interactions between faculty and students who have undergraduate or graduate degrees in biology, engineering, mathematics, computer science, psychology, neuroscience, molecular biology, behavior, cell biology, genetics and other disciplines. They work at many different levels of analysis, including research on cell-molecular neurobiology, systems-level analysis of normal and disrupted neural circuits due to disease, neural engineering, and cognitive and computational neuroscience. In addition to our NIH Neuroscience T32 training, grant, the diversity in research is matched by our faculty also having training positions on Hearing and Communication and Stem Cell and Developmental Biology NIH T32 Training Grants. This reflects the national recognition of the excellence of the research programs of our training faculty, who seek to work with the best and brightest students in their laboratories. When combined with a varied curriculum, a focus on professional development, grant writing, and science communication, weekly seminars, an annual graduate student symposium, and an extremely active neuroscience graduate student forum, the USC Neuroscience Graduate Program provides a highly supportive, research-intensive training experience designed to prepare students for a variety of successful careers.

University of Texas Health Science Center at San Antonio

Program Representative: David Morilak, Ph.D.

http://uthscsa.edu/neuroscience/

The Neuroscience Program at UTHSCSA provides didactic and laboratory training in a range of subject areas and levels of analysis from molecular, cellular, and neurochemical to systems, behavioral, and clinical, all focused on the regulation and function of the nervous system. Drawing on the expertise of approximately 50 faculty from 5 basic science departments and 8 affiliated departments or divisions within the medical and dental schools, we emphasize a flexible program of study and research tailored to the individual needs and interests of all students in Neuroscience. In addition to track-specific fundamental and elective courses, we offer a rich diversity of research rotation opportunities, upper-level elective courses, and a broad selection of faculty dedicated to mentoring graduate students in dissertation research. In addition, Neuroscience students will enjoy a number of enrichment opportunities, including journal clubs, seminars, an annual retreat, participation in brain awareness week activities, and several social functions. Students are encouraged to present their research in a variety of settings, to attend professional meetings locally, nationally and even internationally, and to publish their work in peer-reviewed professional journals. A highly interactive community of faculty, post-doctoral fellows, laboratory staff and fellow students all contribute to a challenging, stimulating and supportive environment within

which our students can develop into successful neuroscientists. The UTHSCSA and the Neuroscience Program are committed to excellence through diversity in education and employment, and all qualified students are encouraged to apply. We are dedicated to providing an environment where success in our program will be determined solely by the ability to succeed as a neuroscientist!

University of Utah

Program Representative: Jim Heys, Ph.D.

http://neuroscience.med.utah.edu/

The University of Utah's Interdepartmental Graduate Program in Neuroscience is designed to provide predoctoral students with a broad-based training in neuroscience disciplines. Founded in 1986, the program is comprised of 76 participating faculty and 15 associate faculty from 19 Departments across five colleges, and 49 students currently enrolled in the program. The program was established to offer students broader training in neuroscience through a wider choice of mentors than is available in a conventional department- or program/institute-based program and offers opportunities for Ph.D. students to train in clinical departments (students currently in Neurology, Ophthalmology, Pediatrics, Psychiatry). Increasingly, progress in the study of neurobiology requires multidisciplinary approaches that draw from electrophysiology, molecular biology, genetics, behavior and cognitive neuroscience. We have created a program that trains students in all of these areas. Lectures from visiting scientists, retreats at the Snowbird Resort, student retreats and Brain Institute symposia expose students to research being conducted internationally. We consider the training of neuroscientists to be our most important mandate.

University of Washington

Program Representative: Paul E. M. Phillips, Ph.D.

http://depts.washington.edu/neurogrd/

The goal of the Graduate Program in Neuroscience is to produce the best neuroscientists possible. The breadth of our faculty allows us to provide interdisciplinary training drawing from a variety of topics, techniques and perspectives, including neuroanatomy, biochemistry, molecular biology, physiology, biophysics, pharmacology, in vivo brain imaging (e.g., fMRI, M-EEG), computational modeling and behavior. A graduate of our program will be well versed in the neurosciences, prepared to conduct independent research, and equipped to pursue a variety of career paths. The 140+ faculty members of the University of Washington provide outstanding graduate training in all areas of modern neuroscience. Our students perform cutting-edge research, at a leading research university, in one of the most famously livable American cities. What does it mean that we are a ‘Program’ and not a ‘department’? It means that we draw faculty from departments across campus and from affiliated institutes across Seattle to train our students. Students in our program are often considered to be de facto members of the department in which their faculty mentors have a primary appointment, but their diplomas show that their Ph.D. degree is in Neuroscience. Our faculty and students are bound together by a common commitment to graduate education in Neuroscience, and we all benefit from the synergy of our diverse approaches to understanding the brain.

Vanderbilt University

Program Representatives: Lisa Monteggia, Ph.D.; Danny G. Winder, Ph.D.

https://medschool.vanderbilt.edu/brain-institute/

Vanderbilt’s Neuroscience Graduate Program prepares each student to make significant contributions in neuroscience and fosters development from trainee to independent research scientist and educator. This is achieved by combining sound training in the fundamentals of neural science with more specialized training that focuses on the integration of this knowledge base into a study of nervous system function and disease. The distinguished training faculty of the Vanderbilt Brain Institute Neuroscience Graduate Program at Vanderbilt University reflects the multidisciplinary nature of modern neurobiological inquiry, and is drawn from diverse fields such as Psychology, Biochemistry, Molecular Physiology, and Pharmacology.

Students have the option of a curriculum and research program that emphasizes either Cellular & Molecular or Cognitive & Systems neuroscience. The training, which combines rigorous course work with opportunities for state-of-the-art research, is designed to prepare graduates for a future in which neuroscientists must be able to make the transition from molecules and cells to neural systems and behavior. Graduates of our department are superbly prepared for a variety of career options in both academia and industry. Due to an excellent faculty-student ratio, extensive opportunities are available for interaction and exchange of ideas in a relaxed and collegial atmosphere. Each student's program is designed to provide a broad-based education in neuroscience yet accommodate individual needs and interests to allow students to become creative, independent scientists.

Wake Forest School of Medicine

Program Representative: Carol Milligan, Ph.D.

http://neuroscience.graduate.wfu.edu/

The Neuroscience Program at Wake Forest is a vibrant, productive, and collaborative effort by faculty and trainees to investigate molecular and cellular structures, local neural circuits and brain areas, and behavior to enhance our understanding of the functional organization of the nervous system. We are committed to the idea that neuroscience, broadly conceived, provides a fundamental framework for understanding the biological basis of behavior and the causes of neurological and psychiatric disorders. For almost 30 years, our graduate program has provided state-of-the-art research training, coupled with foundational and specialized knowledge, and career development opportunities to students. As scientists and educators, we embrace our responsibility to train individuals capable of pioneering research into both normal development and function of the nervous system and into the underlying causes and mechanisms of neurological disease. While the vast majority of our graduating Ph.D. students go on to research-related positions, the ability to expertly analyze and interpret data provides a foundation for success in a wide variety of professions including finance, law, public policy, and education. We feel strongly that the Neuroscience program at Wake Forest provides students with a rigorous, critical thinking skillset — and that is precisely what will be required to tackle the burden on society of neurological disorders and disease.

Washington University in St. Louis

Program Representatives: Tamara Hershey, Ph.D.; Erik Herzog, Ph.D.; Timothy E. Holy, Ph.D.; Sally Vogt

http://neuroscience.wustl.edu/

From the earliest work on nerve impulses to the current imaging of human brain activities, the laboratories of Washington University have been at the forefront of training outstanding young neuroscientists. Today that training is organized into a comprehensive Neuroscience Ph.D. program representing more than 130 faculty and currently hosting 105 students. Our faculty foster an exceptionally diverse learning environment, spanning more than 16 clinical and pre-clinical departments, thus the Program includes a broad spectrum of research laboratories that study how the brain works, how it develops, and how it malfunctions in disease. We take pride in our friendly and vibrant work environment. Consistently ranked as one of the top 10 in the country, our program is also highly regarded for its collegial atmosphere and extensive interactions between laboratories. The superb resources and the breadth of faculty interests provide our students with the experiences and background that are critical to define their own professional interests and goals. Because our students are our best ambassadors, we urge you to come and visit us, and see the Neuroscience Program for yourself.

Yale University

Program Representative: Charles Greer, Ph.D.

http://medicine.yale.edu/inp/

The interdisciplinary research programs of Yale neuroscience faculty are central to Yale's Interdepartmental Neuroscience Program (INP). This unique, broad-based training program is best described as a "department without walls," with the primary purpose of providing students with a maximum of diversity and depth in the most important areas of neuroscience research. The training program draws on the knowledge and expertise of more than 100 faculty members, representing 20+ departments in both the Faculty of Arts and Science and the School of Medicine, ranging from psychiatry to pharmacology, from cell biology to computer science. Although each faculty member has strong department affiliations, the INP Faculty functions as a cohesive and collaborative unit whose aim is to foster in graduate students an appreciation of and familiarity with the breadth of neuroscience and to create an environment in which students are encouraged to study problems from several perspectives. The INP seeks to produce neuroscientists with both specialized knowledge and a broad-based understanding of the discipline. This is accomplished in part through a core curriculum which is designed to ensure a comprehensive understanding of modern neuroscience. Students complete at least two laboratory rotations in different areas of neuroscience. These basic requirements, in addition to bi-weekly journal clubs, a seminar series and an annual research retreat, expose students to the multi-disciplinary nature of the field in a highly interactive environment.

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SFN ACTIVITIES FOR ENDURE STUDENTS: OCTOBER 19-23

SATURDAY Oct 19

7:00 – 11:30 am 9th Annual NIH Blueprint ENDURE Meeting

Location: Hyatt Regency McCormick Place, Regency Ballrooms AB

7:00 – 7:30 am Registration
7:30 – 8:05 am Introductions & Welcome
8:05 – 9:45 am Featured Speakers
9:45 – 11:30 am Graduate Program Recruitment and Networking Fair

12:00 – 2:00 pm Imposter Syndrome: Confronting the Career Development Monster Hiding Under the Bed (Professional Development Workshop)

Panelists: Rebecca M. Calisi, Ph.D.; Nanthia A. Suthana, Ph.D.; Erich D. Jarvis, Ph.D.; Rockelle Guthrie; Gina R. Poe, Ph.D.
Location: McCormick Place Convention Center, Room N228
Description: Imposter syndrome, an internalized fear of being 'exposed as a fraud', impacts ~70 percent of the population, particularly women and underrepresented groups, and may slow or stall optimal career advancement. This workshop is about leaning into, getting at the roots of, and reframing this intellectual self-doubt to confront the 'imposter' within us. Participants will learn from other neuroscientists' experiences as well as develop and implement their own strategies for reducing imposter behaviors.

1:00 – 3:00 pm Graduate School Fair

Location: McCormick Place Convention Center, Hall A
Description: Meet face-to-face with student advisors, program faculty, and graduate school representatives at the Graduate School Fair.

6:30 – 8:30 pm Diversity Fellows Poster Session

Location: McCormick Place Convention Center, Hall A
Description: A special poster session and networking event featuring participants of the Neuroscience Scholars Program (NSP), ENDURE, D-SPAN, and SPINES. The Neuroscience Scholars Program (NSP) is a two-year training program open to underrepresented graduate students and postdoctoral researchers.

7:30 – 9:30 pm Career Development Topics: A Networking Event

Location: McCormick Place Convention Center, Hall A
Description: Experienced neuroscientists will answer questions on a wide range of topics at this informal, roundtable event. Topics include work-life balance, securing grants, setting up a lab, choosing a postdoctoral position, and careers outside of academia, among others. Nearly 30 tables will be offered at the event. During the event, attendees will have the opportunity to rotate among the tables that are of interest to them. Neuroscientists at all career stages are encouraged to attend.

SUNDAY Oct 20	*Plan Your Itinerary for Neuroscience 2019* **Morning and Afternoon Scientific Program Events** • Featured lectures • Symposia • Special lectures • Minisymposia **9:00 – 11:00 am Navigating Team Science (Professional Development Workshop)** **Panelists:** Anne K. Churchland, Ph.D.; John Davenport, Ph.D.; Bolu Ajiboye, Ph.D.; Cristopher D. Bragg, Ph.D. **Location:** McCormick Place Convention Center, Room N227 **Description:** As Neuroscience becomes more interdisciplinary it requires expertise from multiple sub-fields, leading to collaborations within and outside of academia. This workshop will showcase different types of "team science" projects. Trainees and young investigators who are interested in team science are encouraged to attend to hear how the featured projects were conceived and managed and learn the pros and cons of working with scientists from different backgrounds towards a common goal. **12:00 – 2:00 pm Graduate School Fair** **Location:** McCormick Place Convention Center, Hall A **12:00 – 2:00 pm Becoming a Resilient Scientist (Professional Development Workshop)** **Panelists:** Aurelio Galli, Ph.D.; Shahriar Sheikhbahaei, Ph.D.; Lorna W. Role, Ph.D.; Sharon Milgram, Ph.D. **Location:** McCormick Place Convention Center, Room N227 **Description:** Resilience is important in navigating your career in science. In this interactive workshop, we will discuss attitudes and behaviors that can get in our way and explore strategies for building resilience, dealing with self-doubt, and developing our confidence. The workshop will highlight the emotional intelligence competencies needed for success in research and healthcare careers and will provide insights into approaches for developing these competencies as part of your training experience. **6:30 – 8:30 pm NIH Funding and You: A Practical Guide for a Trainee to Survive and Thrive in Your Research Career** **Sponsor:** NIH Neuroscience Blueprint Institutes **Location:** Hyatt Regency McCormick Place, Regency Ballroom A **Description:** This workshop will discuss factors NIH neuroscience Institute staff have found to be important to the success of trainees in the realm of both training itself and grant writing. Funding opportunities and the mechanisms that contribute to successful and unsuccessful grant applications will be discussed. Brief talks will be followed by an extensive question and answer session.

MONDAY Oct 21	*Plan Your Itinerary for Neuroscience 2019* **Morning and Afternoon Scientific Program Events** •Featured lectures •Symposia •Special lectures •Minisymposia **12:00 – 2:00 pm Graduate School Fair** Location: McCormick Place Convention Center, Hall A **5:15 – 6:30 pm Presidential Special Lecture: The Cell Biology of the Synapse and Behavior** Speaker: Daniel A. Colón-Ramos, Ph.D., Yale University Location: McCormick Place Convention Center, Hall B Description: When, where, and how synapses form underpin the architecture of the nervous system and behaviors. Synapses are both precisely assembled during development and flexible during learning and memory. How can synapses be both precise and malleable to facilitate both the assembly and function of the brain? This lecture will discuss new findings that link the fundamental cell biological properties of single synapses to how they underpin the emergent property of the nervous system: behavior. **7:00 – 8:00pm Diversity in Neuroscience Reception** Location: Hyatt McCormick Place Room, Regency CDE **Description: A special reception in honor of the SfN diversity programs, and the NINDS-funded R25 Neuroscience Scholars Program. There will be brief presentations by the President and President-elect of the SfN.**
TUESDAY Oct 22	*Plan Your Itinerary for Neuroscience 2019* **Morning and Afternoon Scientific Program Events** •Featured lectures •Symposia •Special lectures •Minisymposia **12:00 – 2:00 pm Graduate School Fair** Location: McCormick Place Convention Center, Hall A

MENTORING RESOURCES

"A mentor is not someone who walks ahead of you to show you how they did it. A mentor walks alongside you to show you what you can do." – Simon Sinek

Getting the Most Out of Your Mentoring Relationship
https://neuronline.sfn.org/Articles/Professional-Development/2015/Getting-the-Most-Out-of-Your-Mentoring-Relationship

How to Find the Right Mentors and Ask for Career Advice
https://neuronline.sfn.org/Articles/Professional-Development/2015/How-to-Find-the-Right-Mentors-and-Ask-for-Career-Advice

How to Get the Mentoring You Want: A Guide for Graduate Students at a Diverse University
http://www.rackham.umich.edu/downloads/publications/mentoring.pdf

Making the Right Moves and Training Scientists to Make the Right Moves
http://www.hhmi.org/programs/resources-early-career-scientist-development

Your Science Avengers: How to Assemble Your Mentoring Team
https://neuronline.sfn.org/Articles/Professional-Development/2017/Your-Science-Avengers-How-to-Assemble-Your-Mentoring-Team

Individual Development Plan (IDP), a Web-based career-planning tool created to help graduate students and postdocs in the sciences define and pursue their career goals
http://myidp.sciencecareers.org/

Mentoring Compacts: Example compacts for download are available at
https://ictr.wisc.edu/mentoring/mentoring-compactscontracts-examples/

National Research Mentoring Network
https://nrmnet.net/

PROFESSIONAL ORGANIZATIONS

Venues for professional development activities, scientific presentations and networking opportunities with diverse peers, faculty, and academic biomedical research Institutions.

Association of American Indian Physicians (AAIP) - https://www.aaip.org/

Annual Biomedical Research Conference for Minority Students (ABRCMS) - http://www.abrcms.org/

Association of Minority Health Professions Schools, Inc. (AMHPS) - https://www.minorityhealth.org/

Hispanic Association of Colleges and Universities (HACU) - https://www.hacu.net/

Society for the Advancement of Chicanos and Native Americans in Science (SACNAS) - https://www.sacnas.org/

Neuroscience Scholars Program (NSP) at Society for Neuroscience - https://www.sfn.org/Initiatives/Diversity-Programs/Neuroscience-Scholars-Program

This is the last page of the booklet but turns the first page of YOUR FUTURE! ENDURE alumni are changing the face of neuroscience research and making an impact on research knowledge. Stay connected to the ENDURE network and as scientists use the evidence below to replicate your own success!

ENDURE Trainees and Alumni: visit and like the ENDURE Facebook page, www.facebook.com/BP.ENDURE

- build/maintain a support system
- facilitate future transition & research collaboration
- provide awareness of neuroscience resources within and outside of NIH

ENDURE Outcomes (*as of Sep 2019*): 162 of 284 alumni (~60%) are currently enrolled in graduate programs!

- 88 in Ph.D. programs
- 27 in clinical doctoral programs (M.D. or D.O., M.D./Ph.D., D.P.T.)
- 47 in M.S degree./postbac programs

Ph.D. Graduate Programs of ENDURE Alumni

Albert Einstein College of Medicine	Massachusetts Institute of Technology	University of Arizona	University of North Carolina at Chapel Hill
Baylor University	Michigan State University	University of California, Berkeley	University of Pennsylvania
Boston University	New Mexico State University	University of California, Los Angeles	University of Pittsburgh
Brown University	New York University	University of California, San Francisco	University of Puerto Rico
Columbia University	Ohio State University	University of Cincinnati	University of Southern California
Cornell University	Oregon Health & Science University	University of Colorado Anschutz Medical Campus	University of Texas at San Antonio
City University of New York	Ponce School of Medicine	University of Colorado Boulder	University of Texas Health Science Center at San Antonio
Emory University	Princeton University	University of Georgia	University of Texas Southwestern Medical Center
Georgetown University	Rosalind Franklin University	University of Houston	University of Utah
Harvard University	Stanford University	University of Illinois in Chicago	University of Wisconsin-Madison
Icahn School of Medicine at Mount Sinai	University of Washington	University of Iowa	Washington State University
Institute of Science and Technology Austria	University of Alabama	University of Massachusetts Amherst	Washington University in St. Louis
Johns Hopkins University	University of Alabama at Birmingham	University of Michigan	

Many of the remaining known ENDURE alumni are doing great things in their careers as well!

- **Postdoctoral training** = 7 at domestic and international institutions
- **Medical training** = 5 in anesthesia, internal medicine, and pediatric residencies
- **Research** = 22 as research assistants, lab technicians, and clinical research associates
- **Science policy** = 1 in the AAAS Science & Technology Policy Fellowship
- **Other careers =** 50 in teaching, pharma/biotech industry, physical therapy, pharmacy, nursing, etc.

NOTES

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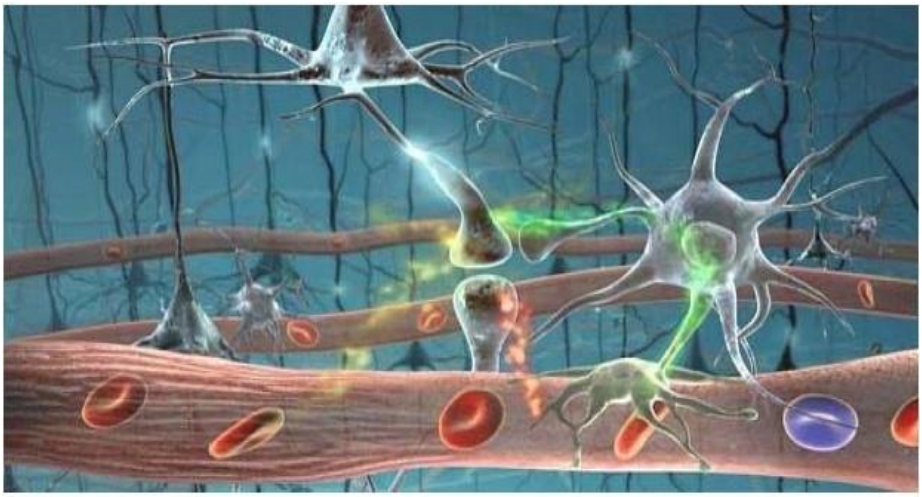

THANK YOU FOR YOUR PARTICIPATION!!