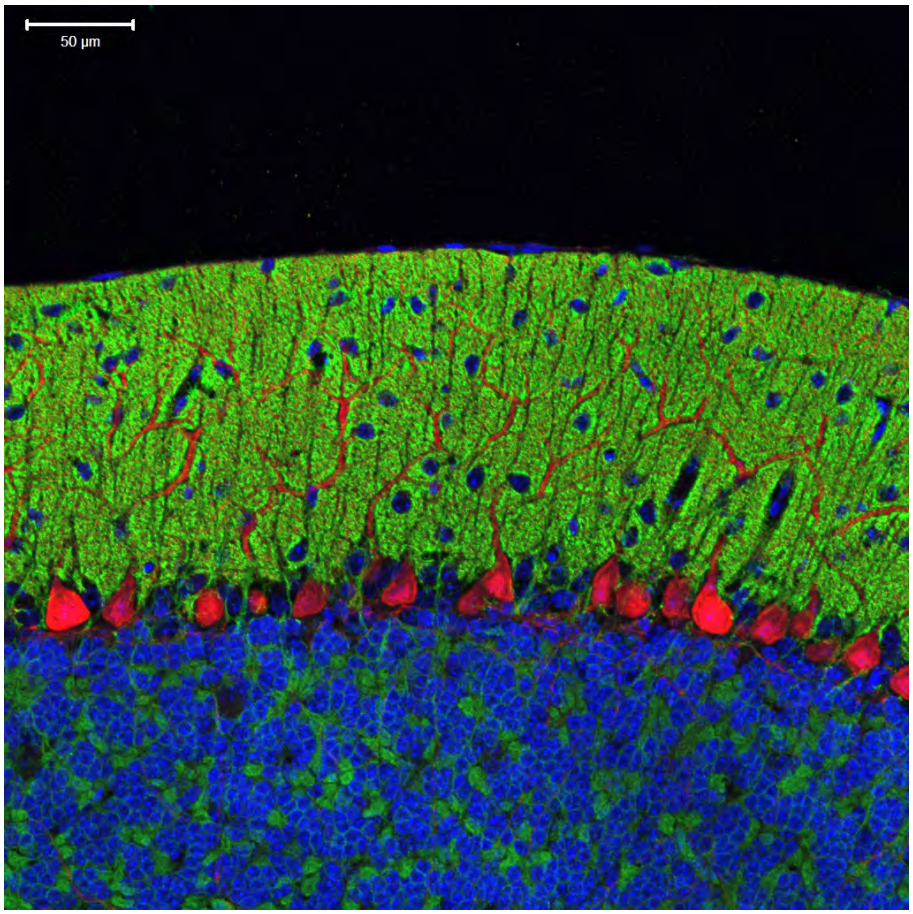
THE NEUROSCIENCE INSTITUTE
UNIVERSITY OF TENNESSEE HEALTH SCIENCE CENTER

THEC Neuroscience Center of Excellence

Annual Report to the

Tennessee Higher Education Commission (THEC)

Fiscal year 2018 (7/1/2017-6/30/2018)



I. MISSION STATEMENT

The Neuroscience Institute at UTHSC is supported by the Neuroscience Center of Excellence, one of several Centers of Excellence established by the Tennessee Higher Education Commission in 1985. Our mission to develop and support multidisciplinary research and training in neuroscience. We feature basic science and clinical members spanning 10 departments, and foster neuroscience research through support of neuroscience track graduate students and postdocs, the Neuroscience Imaging Center and Behavioral Core, a robust seminar series, and start-up packages for new faculty. The brain is the final frontier of biology. Scientific inquiry has produced remarkably detailed knowledge of the physical world and much of the life sciences, including details of the human genome. However, our knowledge of the brain is far from complete. The nature and mechanisms of consciousness, thought, perception, learning, memory and many diseases of the nervous system are poorly understood. Neuroscience is now at an exciting threshold of discovery and unprecedented growth. The resulting explosion of information is rapidly increasing our understanding of the basic mechanisms of brain structure and function. This emerging knowledge is helping us discover effective treatments and even cures for some neurological diseases. More information concerning the Institute is available at: https://www.uthsc.edu/neuroscience/

II. EXECUTIVE SUMMARY

In FY 2018 the NI/Center of Excellence finished the seed support of Dr. Victor Chizhikov, an associate professor and developmental neurobiologist who obtained his first R01. We began seed support of new assistant professor Tauheed Ishrat, a stroke neuroscientist. We provided matching funds to 6 graduate students, and saw our 3rd Neuroscience track graduate student in the past 3 years, Jessica Baker, awarded an NIH F31 predoctoral fellowship with the mentorship of NI member Kristen Hamre. Jessica joins NI members Sarah Neuner and Jordan Ross as the *only NIH-funded students* on campus! Currently there are 17 students in the Neuroscience Track of the Integrated Biomedical Sciences Ph.D. program after graduating 3 and accepting 3 new students. We also supported 9 postdocs with matching funds in the Departments of Anatomy and Neurobiology, Neurology, Ophthalmology, Pharmacology and Physiology, and 4 undergraduate summer Neuroscience merit fellows from Christian Brothers University and Rhodes College to work in the departments of Anatomy and Neurobiology, Pharmacology and Neurology. We supported the Neuroscience Imaging Center, a cost-recovery facility providing the only transmission electron microscope (JEOL 2000) on campus, a state of the art Zeiss 710 laser-line confocal microscope, and a Neurolucida 3-dimensional reconstruction workstation. We supplemented the service contracts of these instruments to keep user fees low, and we support the Imaging Center's technical director. We promoted neuroscience research by providing the weekly Neuroscience Seminar series, mixing outside with UTHSC and affiliated faculty. Finally, we added two new members to the Executive Committee, Drs. Tavalin and Naryana.

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IV. ADMINISTRATIVE STRUCTURE

Director: Professor William E. Armstrong, Ph.D.
Department of Anatomy and Neurobiology

Co-Director: Professor Tony Reiner, Ph.D.
Department of Anatomy and Neurobiology

Administrative Specialist: Mistie Brewer

Program Coordinator/IT Specialist: Brandy Fleming, M.S.

Neuroscience Executive Committee:

Matthew Ennis, Ph.D., Professor and Chair, Department of Anatomy and Neurobiology

Jon Jaggars, Ph.D., Professor, Department of Physiology

**Shalini Naryana, Ph.D., Associate Professor, Pediatric Neurology, Le Bonheur Hospital/UTHSC*

Tony Reiner, Ph.D., Professor and NI Co-Director, Department of Anatomy and Neurobiology

Susan E. Senogles, Ph.D., Associate Professor, Department of Molecular Sciences

Jeff Steketee, Ph.D., Professor, Department of Pharmacology

**Steven Tavalin Ph.D., Associate Professor, Department of Pharmacology*

Jim Wheless, M.D., Professor, Chief of Pediatric Neurology and LeBonheur Chair, Le Bonheur Hospital/UTHSC

****New Exec. Comm. Members***

Center Address:

University of Tennessee Health Science Center
875 Monroe Ave., Suite 426, Wittenborg Building
Memphis TN 38163
(901) 448-5960
http://www.uthsc.edu/neuroscience

V. FACULTY OF THE NEUROSCIENCE INSTITUTE

The Neuroscience Institute is currently comprised of 75 faculty members in several different departments on the UTHSC campus, including those with primary appointments at St. Jude Children's Research Hospital and at the University of Memphis and Christian Brothers University, and one faculty member at UT Knoxville. Faculties are listed with each department; those with primary appointments outside UTHSC or UTK are so indicated. * indicates new member. We have added 4 new members (*) this past FY.

Department of Anatomy and Neurobiology

Matthew Ennis, Ph.D., Simon R. Bruesch Professor and Chair
William E. Armstrong, Ph.D., Professor and NI Director
John D. Boughter, Jr., Ph.D. Associate Professor
Joseph C. Callaway, Ph.D., Associate Professor
Angela Cantrell, Ph.D., Associate Professor
Viktor Chizhikov, Ph.D., Associate Professr
Alessandra d'Azzo, Ph.D., Affiliated Professor (St. Jude)
Michael A. Dyer, Ph.D., Affiliated Professor (St. Jude)
Malinda E. C. Fitzgerald, Ph.D., Adjunct Professor (Christian Brothers Univ.)
Max Fletcher, Ph.D., Associate Professor
Robert C. Foehring, Ph.D., Professor
Kristin Hamre, Ph.D., Associate Professor
Detlef Heck, Ph.D., Associate Professor
Marcia G. Honig, Ph.D., Professor
Tauheed Ishrat, Ph.D., Associate Professor
Hitoshi Kita, Ph.D., Professor
Peter J. McKinnon, Ph.D., Affiliated Professor (St. Jude)
James I. Morgan, Ph.D., Affiliated Professor (St. Jude)
Randall J. Nelson, Ph.D., Professor
Anton J. Reiner, Ph.D., Methodist Professor and NI Co-Director
*Lindsay Schwarz, Ph.D., Affilliated Assistant Professor (St. Jude)
Reese S. Scroggs, Ph.D., Associate Professor
J. Paul Taylor, M.D., Ph.D., Affiliated Professor (St. Jude)
Robert S. Waters, Ph.D., Professor
Steven L. Youngentob, Ph.D., Professor
Stanislav Zahkarenko, Ph.D. Affiliated Professor (St. Jude)

Department of Biochemistry and Cellular and Molecular Biology, UT Knoxville

Rebecca A. Prosser, Ph.D., Professor

Department of Genetics, Genomics and Informatics

Robert W. Williams, Ph.D., UT-Oak Ridge National Laboratory Governor's Chair in Computational Genomics Professor, and Chair; Director, Center for Integrative and Translational Genomics

Byron Jones, Ph.D., Professor

Lu Lu, Ph.D., Associate Professor

*Megan Mulligan, Ph.D., Assistant Professor

Burt Sharp, M.D., Van Vleet Professor

Department of Medicine/Cardiology

Syamal Bhattacharya, Ph.D., Professor

Department of Molecular Sciences

Susan E. Senogles, Ph.D., Professor

Department of Neurology

Michael McDonald, Ph.D., Professor

Thaddeus S. Nowak, Ph.D., Professor

Lawrence T. Reiter, Ph.D., Associate Professor

Jack Tsao, M.D., Ph.D., Professor

Department of Neurosurgery

Frederick Boop, M.D., Professor and Chair

Department of Ophthalmology

Rajashekhar Gangaraju, Ph.D., Assistant Professor

Monica M. Jablonski, Ph.D., Professor

Nawajes Mandal, Ph.D., Associate Professor

Vanessa Marie Morales-Tirado, Ph.D., Assistant Professor

Department of Pediatrics, Pediatric Neurology and LeBonheur Children's Hospital

Abbas Babajani-Feremi, Ph.D., Assistant Professor, Pediatrics, Le Bonheur

Joan Han, M.D., Associate Professor, Pediatrics, LeBonheur

Masanori Igarashi, M.D., Associate Professor, Pediatric Neurology, Le Bonheur

Amy McGregor, M.D., Assistant Professor, Pediatric Neurology, Le Bonheur

Shalini Narayana, Ph.D., Associate Professor, Pediatric Neurology, Le Bonheur

Massroor Pourcyrous, M.D., Professor, Pediatrics

James W. Wheless, M.D., Professor and Chief of Pediatric Neurology, Le Bonheur

Department of Pharmaceutical Sciences

Duane D. Miller, Ph.D., Van Vleet Professor and Chairman

Bob Moore, Ph.D., Professor

Department of Pharmacology

Suleiman W. Bahouth, Ph.D., Professor

Anna Bukiya, Ph.D. Associate Professor

Hao Chen, Ph.D., Assistant Professor

Alex M. Dopico, M.D., Ph.D., Professor

*Chang Hoon Jee, Ph.D., Assistant Professor

Francesca-Fang Liao, Ph.D., Professor

Kafait U. Malik, Ph.D., Professor

Kazuko Sakata, Ph.D., Associate Professor

Jeffery Steketee, Ph.D., Professor

Steven J. Tavalin, Ph.D., Associate Professor

*Thirumalini Vaithianathan, Ph.D., Assistant Professor

Fu-Ming Zhou, M.D., Ph.D., Professor

Department of Physiology

Julio Cordero-Morales, Ph.D., Assistant Professor

Ioannis Dragatsis, Ph.D., Associate Professor

Jonathan Jaggar, Ph.D., Maury Bronstein Professor

Charles W. Leffler, Ph.D., Professor

Helena Parfevona, Ph.D., Professor

Valeria Vásquez, Ph.D., Assistant Professor

Paula Dietrich, Ph.D., Assistant Professor

Department of Preventive Medicine

Khyobeni Mozhui, Ph.D., Assistant Professor

St. Jude Children's Hospital (see Departments Above for Affiliated Appointments)

Michael Dyer, Ph.D., Professor

Alessandra D'Azzo, Ph.D., Professor

Peter McKinnon, Ph.D., Professor

James Morgan, Ph.D., Professor

*Lindsay Schwarz, Ph.D., Assistant Professor

J. Paul Taylor, M.D., Ph.D., Professor

Stanislav Zakharenko, Ph.D., Professor

VI. GRADUATE STUDENTS & POSTDOCTORAL STUDENTS

***Graduate Students*:** The NI supports the Neuroscience Graduate Program, which is a division of the Intergrated Biomedical Sciences program at UTHSC. A description of the Neuroscience program can be found at: https://www.uthsc.edu/anatomy-neurobiology/neuroscience_graduate_program.php. This program is directed by NI members Dr. Jay Callaway (Track Director) and Dr. Matt Ennis (Program head and Chair of Anatomy and Neurobiology). Students in this track take Functional Neuroanatomy, and 2 of 3 additional Core courses (Cellular Neuroscience, Behavioral Neuroscience, Developmental and Molecular Neuroscience), in addition to Statistics and Ethics. In addition, all graduate students must take the Neuroscience Seminar Class each year until they pass their qualifying exam, and all students participate in the student Neuroscience Symposium class every year, where they present their research. All students in good standing in the program are awarded matching stipends for at least 2 years (typically, years 3 and 4) of their Ph.D. research with the exception of students working at St. Jude Children's Hospital, which provides their complete stipend. Currently the program has 17 students, four of whom are at St. Jude's, the others of whom placed with mentors at UTHSC in Anatomy and Neurobiology, Neurology, Ophthalmology and Pharmacology. This past academic year saw four students receive their Ph.D. and obtain successful postdocs: Cameron Ogg (currently at St. Jude), Stu McAfee (currently at St. Jude), and Matt Kirchner (currently at Georgia State University). This year, we expect three more senior students will receive the Ph.D. in 2018-2019.

Three students have been awarded nationally competitive NIH F31 predoctoral fellowships: Sarah Neuner, Jordan Ross, and Jessica Baker. Ms. Neuner is doing her research on the genetics of Alzheimer's Disease, in Jackson Laboratories, Bar Harbor, Maine, but remains a student in our program. Ms. Ross works with Dr. Max Fletcher in Anatomy and Neurobiology on olfaction. Ms. Baker is the newest awarded, and she works with Dr. Kirsten Hamre in Anatomy and Neurobiology on development effects of alcohol (**See Appendix 4**). Financial details on support can be found in the budget. These are the only UTHSC students from the larger IBS program to have F31 fellowships, but we have one other neuroscience student, Kevin Hope, who has a fellowship from Dup15q Alliance to study genetics of autism with Dr. Larry Reiter in Neurology.

Postdoctoral Students: The NI supports matching postdoctoral fellowships to some extent every year. We supported 9 postdocs at varying amounts and times this past year (see Budget). The UT Neuroscience Institute competitively awarded 2018 Postdoctoral/Research Associate Awards to the following candidates with mentors in the Neuroscience Institute: Safa Bouabid (Pharmacology, Dr. Fu-Ming Zhou), Purnima Singh (Pharmacology, Dr. Kafait Malik), Mohammad Khan (Neurology, Dr. Mark LeDoux), Kumar Jha (Ophthalmology, Dr. Raja Gangaraju), Mohammed Moustafa (Ophthalmology, Dr. Monica Jablonski) and Rebecca Caires Mugarra (Physiology, Dr. Julio Cordero-Morales). The awardees were selected by the Neuroscience Executive Committee based on their productivity and promise in neuroscience research. Further information on postdoctoral awards is available at https://www.uthsc.edu/neuroscience/postdoc_awards.php.

VII. PROGRAM OVERVIEW AND ACCOMPLISHMENTS

OVERVIEW

***Organizational Structure*:** The Tennessee Higher Education Commission Neuroscience Center of Excellence comprises the administrative core and financial engine of the University of Tennessee Health Science Center's (UTHSC) Neuroscience Institute (NI), which is located within UTHSC's College of Medicine in Memphis, TN. Prof. William E. Armstrong is the Director, and Prof. Tony Reiner is the Co-Director. The Director reports to the Executive Dean of the College of Medicine at UTHSC, Scott Strome, M.D., and the Vice Chancellor of Research, Steven Goodman, Ph.D. Physically the NI is housed within twelve different departments in the College of Medicine and some other UT departments, with an administrative suite in Rm 426 Wittenborg Building at UTHSC. Affiliated members reside at UT Knoxville, Oak Ridge National Laboratory, St. Jude Children's Hospital, LeBonheur Children's Hospital, Christian Brothers University, and at the University of Memphis.

Dr. Armstrong supervises Ms. Brandy Fleming, M.S., who is our Program Coordinator and also functions as our IT specialist. Ms. Fleming and Dr. Armstrong supervise our administrative assistant, Mistie Brewer. With Ms. Fleming's help, the administrative assistant organizes the seminar series including all travel arrangements, assists in ordering and billing, and handles NI official correspondence. The Neuroscience Imaging Center is managed by TJ Hollingsworth, Ph.D. Dr. Hollingsworth reports to Dr. Armstrong.

History: The Neuroscience Center of Excellence at UTHSC was established in 1985 and designated an accomplished Center of Excellence by the Tennessee Higher Education Commission in 1988. In 1998, the Neuroscience Center of Excellence was designated as the University of Tennessee Neuroscience Institute, with dedicated space in the Wittenborg, Link and Johnson buildings. The Neuroscience Center of Excellence award was designed to support graduate and postdoctoral education, to recruit and provide initial support to new neuroscience faculty, to renovate laboratory facilities, to purchase research equipment, to host symposia, a weekly seminar series, and to support community outreach programs such as those associated with Brain Awareness Week. The Director from 1985-2002 was Dr. Steven T. Kitai (retired, 2002). Dr. David Smith was named director from 2002-2006 (deceased, Sept. 2006), and Dr. William Armstrong has been director since 2006.

The program brings together neuroscience faculty members from the Departments of Anatomy and Neurobiology, Medicine, Molecular Sciences, Neurology, Neurosurgery, Ophthalmology, Pathology, Pediatrics, Pharmaceutical Sciences, Pharmacology, Physiology, Psychiatry, and Surgery, and in the Department of Biochemistry and Cellular and Molecular Biology at the University of Tennessee, Knoxville. Strong affiliations exist with Methodist University Hospital, Le Bonheur Children's Hospital, St. Jude's Children Hospital, the University of Memphis, Rhodes College, and Christian Brother's University. The interdepartmental nature of the program and the collaborations it fosters provide the cross-disciplinary environment necessary for high quality neuroscience research.

***Neuroscience Administrative Suite and Conference Rooms*:** The NI maintains an administrative suite with offices for the Director, Program Coordinator, and Administrative Assistant in the Wittenborg Building, 4th floor (Room 426). This suite also contains 2 conference rooms, one large room for classes, lab meetings, and large committee meetings, and a smaller room for small meetings. We also maintain a breakroom for the NI staff, as well as for staff from the animal vivarium located in the basement of the Wittenborg building, which houses animals for Anatomy and Neurology, Physiology, and Neurology faculty.

Neuroscience Imaging Core: The NI maintains a full-service Imaging Center (https://www.uthsc.edu/neuroscience/imaging-center/index.php) housing confocal microscopes, electron microscopes, 3-dimensional reconstruction workstations, microtomy facility and lab and office space for the Director of the Imaging Core, Dr. Hollingsworth, located on the 3rd floor of the Link Building. This is a cost recovery facility that NI supports in order to keep costs low. Scheduling is on-line.

Neuroscience Behavioral Core: This core is located on the 3rd floor of Wittenborg building (https://www.uthsc.edu/neuroscience/behavioral-core/), and is managed by Professor Mike McDonald of Neurology. NI helped recruit Dr. McDonald several years ago, providing him 3 years of salary support and an office. Dr. McDonald is extremely well funded and successful, and personally trains users in the great variety of testing equipment available in this core. This core is free of use to any UTHSC faculty, but NI occasionally supplies equipment and software on an as-needs basis. Scheduling is on-line.

Neuroscience Institute Web Site: Our Program Coordinator, Ms. Brandy Fleming, maintains the NI website (https://www.uthsc.edu/neuroscience/). This site contains information about our cores, the graduate and postdoctoral support programs, undergraduate fellowships, conference room and core on-line scheduling, faculty funding, spotlights on new faculty, seminars and symposia, and a full list of participating departments and NI faculty members. Ms. Fleming maintains 2 servers for NI members. One server is for file exchange for users of the Imaging Center. All images are digitally acquired from our confocal and electron microscopes, and these can be uploaded to this site by users, stored for a month, and downloaded at their convenience during that period. We also maintain a second server for archiving all NI business.

Areas of Neuroscience Research

Neurological and Neurodegenerative Disorders:

Neurological diseases include disorders of the nervous system arising from nervous system malfunction or degeneration. Current areas of focus within NI include: cellular and network physiology of basal ganglia in the context of Parkinson's disease, traumatic brain and eye injury, stroke, neuronal dysfunction and death in Huntington's disease, the molecular biology of synaptogenesis in dystonia, and animal models of Alzheimer's disease.

Faculty:

A. Babajani-Feremi	*Ped. Neurology*	I. Dragatsis	*Physiology*
R. Homayouni	*U of Memphis*	D. Heck	*Anat. & Neurobiology*
M. Jacewicz	*Neurology*	B. Jones	*Genetics, Gen. Inform.*
M. LeDoux	*Neurology*	H. Kita	*Anat. & Neurobiology*
S. Naryana	*Ped. Neurology*	F-F. Liao	*Pharmacology*
L. Reiter	*Neurology*	T. Nowak	*Neurology*
T. Ishrat	*Anat & Neurobiology*	A. Reiner	*Anat. & Neurobiology*
J. Wheless	*Ped. Neurology*		

Excitable Properties of Neurons

Behavior, mentation and physiological homeostasis are all a function of neuronal activity in the nervous system. This activity can be encoded by membrane polarity or in the rates and patterns of neuronal action potentials. Information is passed among neurons through synaptic transmission.

Faculty:

R. Foehring	*Anat. & Neurobiology*	H. Kita	*Anat. & Neurobiology*
W. Armstrong	*Anat. & Neurobiology*	R. Scroggs	*Anat. & Neurobiology*
J. Callaway	*Anat. & Neurobiology*	S. Tavalin	*Pharmacology*
J. Cordero-Morales	*Physiology*	R. Waters	*Anat. & Neurobiology*
A. Dopico	*Pharmacology*	V. Vásquez	*Physiology*
M. Ennis	*Anat. & Neurobiology*	D. Heck	*Anat. & Neurobiology*

Sensory Information Processing

Sensory systems extract information from the environment and provide the nervous system an interface with the outside world. Understanding the way in which this information is represented in neuronal activity is the focus of this research group, which includes the study of olfaction, taste, pain, and vision.

Faculty:

M. Ennis	*Anat. & Neurobiology*	R. Nelson	*Anat. & Neurobiology*
J. Boughter	*Anat. & Neurobiology*	R. Scroggs	*Anat. & Neurobiology*
J. Cordero-Morales	*Physiology*	R. Waters	*Anat. & Neurobiology*
M. Fletcher	*Anat. & Neurobiology*	V. Vásquez	*Physiology*
D. Heck	*Anat. & Neurobiology*		

Vision and Retina

Understanding the normal function of the eye and the way this process is affected by disease is the primary interest of this group. Researchers are addressing the normal development of the eye as well as the genetic basis of function and disease.

Faculty:

M. Dyer	*Ophthalmology*	A. Reiner	*Anat. & Neurobiology*
M. Fitzgerald	*Anat. & Neurobiology/St. Jude*	R. Gangaraju	*Ophthalmology*
M. Jablonski	*Ophthalmology*	R. Williams	*Gen., Genomics & Inform.*
N. Mandal	*Ophthalmology*		

Neurogenetics and Development

This group is interested in gaining a deeper understanding of the origins of the impressive structural and functional complexity, diversity, and plasticity of the nervous system. Experimental and technical expertise of this group is broad, ranging from genetic and molecular analysis of the early stages of central and peripheral nervous system development to sophisticated functional assays of neuronal plasticity in response to environmental manipulations.

Faculty:

R. Williams	*Gen, Genomics, & Inform*	*L. Lu*	*Anat. & Neurobiology*
J. Boughter	*Anat. & Neurobiology*	*P. McKinnon*	*Anat. & Neurobiology/St. Jude*
V. Chizhikov	*Anat. & Neurobiology*	*J. Morgan*	*Anat. & Neurobiology/St. Jude*
A. d'Azzo	*Anat. & Neurobiology/St. Jude*	*K. Mozui*	*Preventive Medicine*
I. Dragatsis	*Physiology*	*A. Reiner*	*Anat. & Neurobiology*
K. Hamre	*Anat. & Neurobiology*	*L. Reiter*	*Neurology*
J. Han	*Pediatrics/Le Bonheur*	*M. Honig*	*Anat. & Neurobiology*

Mental and Addictive Disorders

Mental and addictive disorders are due to changes in normal brain function. This research group collaboratively explores changes in brain function that might explain mental disorders, such as depression and addiction, and drug-induced changes in brain function that may be responsible for relieving mental disorders or producing addiction.

Faculty:

H. Chen	*Pharmacology*	B. Sharp	*Pharmacology*
A. Dopico	*Pharmacology*	J. Steketee	*Pharmacology*
K. Hamre	*Anat. & Neurobiology*	S. Tavalin	*Pharmacology*

K. Sakata *Pharmacology* F. Zhou *Pharmacology*

ACCOMPLISHMENTS

Faculty support and recruitment: NI provided $195,000 in seed money toward the seed package for Dr. Victor Chizhikov and has begun disseminating funds to Dr. Tauheed Ishrat ($150,000). Dr. Chizhikov has used his funds effective September of 2018 after distributing these funds over the past 5 years. Dr. Ishrat started drawing on his funds in February of 2018 and will have five years to spend the $150,000. Dr. Chizhikov was awarded an R01 from NIH in July of 2016, and he was promoted to associate professor and awarded tenure July 1, 2017. He is an outstanding developmental neurobiologist, studying abnormal development of cortex and cerebellum related to such syndroms as Dandy-Walker. Dr. Ishrat came in as an associate professor, and also has an R01. He has submitted a second R01 which is pending review. He is a stroke neurobiologist and is interested in factors that mitigate or exacerbate stroke susceptibility in a focal ischemia model.

Acquisition of Equipment for Cores: In the past, NI has contributed matching funds for multi-user equipment grants, including those obtained from NIH for an electron microscope, for two confocal microscopes, for a computerized light microscope for three-dimensional neuronal reconstructions, and a high resolution digital camera attachment for the electron microscope, all are located in the Neuroscience Imaging Core and are maintained and supervised by a dedicated Technical Manager (Dr. TJ Hollingsworth) provided by the NI. This past year we renewed our license for the Neurolucida Imaging suite and reconditioned the Leica Cryostat. The web site for the Imaging Center is constantly refreshed: (http://www.uthsc.edu/neuroscience/imaging-center/index.php) and features on line scheduling for equipment use.

Graduate Student Recruiting: Our interdisciplinary Graduate Neuroscience Track attracts outstanding applicants from around the country, with an emphasis on those in the Mid-South. We currently have 17 Neuroscience students, including 4 new students who entered in the Fall of 2018, and 4 students who entered in the Fall of 2017. This academic year we will graduate another 3 senior students from the program, Sarah Neuner, Zach Goldsmith and Kevin Hope. This past year we graduated Cameron Ogg, Nick Saites, Stu McAfee, and Matt Kirchner. Our recruiting flyer can be found at the end of **Appendix 4**, but through surveying students we find that most discover the program based on the Web site.

***Postdoctoral Research Awards*.** The NI provided matching funds on a competitive basis for 7 postdoctoral fellows or research associates for FY 2017-2018. These awards range from $10,000-$15,000 each.

***NI Neuroscience Seminar Series and Symposia*:** This series is a major mechanism for interaction among neuroscience faculty and students and brings outstanding neuroscientists from around the world to the UTHSC

campus. During the 2017-2018 academic year, the NI sponsored the weekly Neuroscience Seminar Series, hosting 24 seminars. Of these, 16 neuroscientists from outside UTHSC and 8 from within the NI presented their recent research findings to UT faculty and students. The NI seminar series serves as the basis for a graduate course, Neuroscience Seminar (ANAT 821), which is attended by all neuroscience track IPBS graduate students and within which they read papers by and meet with the visiting scientists (course director Megan Mulligan). This seminar program is vital to the Neuroscience Track of the Graduate Program and to the entire UT neuroscience community, serving to keep our faculty and students abreast of recent developments and, perhaps even more important, to showcase our strengths to national and international leaders in neuroscience research visiting our campus. NI also assists in the Student Seminar course (course director William Armstrong), where students give seminars and receive critical feedback from their colleagues. A complete list of FY 2017-2018 seminar speakers and their topics are provided in **Appendix 3**.

***Undergraduate Neuroscience Merit Scholarships*:** These are given to outstanding undergraduates at Rhodes College, Christian Brothers University (CBU) and University of Memphis. The Rhodes and CBU scholars work on independent projects for their undergraduate thesis. The scholars (and mentors) for 2017-2018 were Connor Dorian, Rhodes College (Mentors: Dr. Tony Reiner and Marcia Honig), Avani Alapati, Rhodes College (Mentor Dr. Larry Reiter), Michael Mendez, Christian Brothers University (Mentor: Dr. Tauheed Ishrat), and Will Schupp, Rhodes College (Mentor: Dr. Kazuko Sakata). New scholars are picked every Spring. Conor Dorian received the Hunter Award for excellence in Neuroscience from Rhodes University, based on his work with Drs. Reiner and Honig (Appendix 4).

VIII. GOALS AND FUTURE PLANS

***Faculty Support and Recruitment*: 1)** We were given permission by Chancellor and Interim Executive Dean of the College of Medicine (COM) , Steve Schwab, to recruit a mid-level neuroscientist into the Department of Anatomy and Neurobiology for FY2018. Our proposal was to recruit into our strongest extramurally supported group, Neurodegenerative disease. The Chair of Anatomy and Neurobiology, Dr. Matt Ennis, and Dr. Armstrong co-chaired the search committee for this recruitment. This resulted in the acceptance of a position by Dr. Il Hwan Kim of Duke University, who studies the neural pathways involved in social behavior using modern techniques such as optogenetics and cell specific targeting. Dr. Kim is funded with an R56 from NIH, and has received a fundable 9% on a newly submitted R01. NI committed $150,000 to Dr. Kim's startup, partnering with the COM. The new Dean of COM, Scott Strome, has given us the go ahead to also pursue the candidate ranked second in this search, Dr. Qian Sun of Columbia University. Dr. Sun is an expert neurophysiologist studying the cellular mechanisms underlying learning in the hippocampus, and the effects of stress thereon. Dr. Sun is funded with K03 award. NI will contribute some portion of Dr. Sun's seed package, to be determined. **2)** NI will continue the seed money support for Dr. Tauheed Ishrat, now in his second year at UTHSC. **3**) NI members Drs. Armstrong,

Reiner and Ennis will continue to mentor newly Tauheed Ishrat, and he has just submitted his second R01. His seed money support started in February of 2018.

Core Support: NI will continue to support the Imaging Center (including Microtomy lab), and Behavioral Core. This requires collecting and processing user fees, paying service contracts, and repairing/replacing equipment. Further Details are found in the budget for FY 2019 below.

Graduate Student Support and Recruiting: We will recruit 4-6 new students into the Neuroscience Track for Fall of 2019. These interviews run from January-March of 2019. As detailed below for FY 2018, we will support ~6 students in their 3rd or 4th year during the next fiscal year. Dr. Armstrong will continue to run the Neuroscience Student Symposium class with Drs. Ennis, Heck, Fletcher, and Drs. Mulligan and Ishrat will run the Neuroscience Seminar Series class for graduate students. The NI offers travel stipends ($500 per trip) to any Neuroscience student or supported postdoc for a national meeting if they are the first or presenting author of a talk or poster.

***Postdoctoral Research Awards*.** We have committed funds for up to 6 postdocs in FY 2018-2019. Requests for applications will be sent out in November 2018 for a January 2019 start date. These applications are competitive, and ranked by the NI Executive Committee. See Budget for FY 2019 for further details.

NI Neuroscience Seminar Series and Symposia: We will continue to run the Neuroscience Seminar Series, and already have our Fall Schedule, with seminars that started in September. We will solicit nominations from the faculty for Spring in November. We expect to host around 25 seminars, the majority of which will feature guests from out of town. Rather than a Symposium this year, we are considering a workshop in January concerning in vivo imaging methods for rodent research.

***Undergraduate Research Fellows*:** We will support up to 4 undergraduate research fellows from Rhodes College, Christian Brothers University, or University of Memphis. Applications will be processed in the Spring of 2019.

IX. BUDGET (see Schedule 7, page 21)

A. FY 2018. The FY 2018 THEC appropriated budget for the UTNI was $601,491
We carried forward $219,483 from the previous year for a total budget of $820,974. This carryover reflects amounts encumbered but unspent for Graduate Stipends that were picked up previously by NI and are now picked up by UTHSC for the student's first 18 months, and monies encumbered to support our new faculty hires for whom we provided seed packages (Drs. Ishrat and Chizhikov).

This past FY, we expended $473,419 total personnel costs (including salaries and fringe). Personnel costs include administrative supplements for the NI Director (who also directs the NI Imaging Center), the NI Co-Director, a full-time Program Coordinator/ IT specialist, a ¾ time Administrative Specialist, and a full time Technical Manager of Imaging Center**.**

Students: We awarded matching funds for 6 graduate stipends to PIs with Neuroscience track graduate students for a total $51,735. The mentors were located in the departments of Anatomy and Neurobiology and Ophthalmology.

Postdoctoral Support*:* We provided matching funds for 9 postdoctoral fellows, for a toal ~$117,400. The NI Mentors are located in the departments of Anatomy and Neurobiology, Neurology, Ophthalmology, Pharmacology and Physiology.

Neuroscience Imaging Center**:** Currently the NI Imaging Center is run by Dr. TJ Hollingsworth. We supplement our cost-recovery program to keep user fees low, helping to pay the service contracts on our JEOL 2000 Electron Microscope, the Zeiss 710 confocal microscope, and the Neurolucida workstation. This year our cost-recovery program took in $41,157 which was used against the fees needed to pay the service contracts on the Zeiss 710 ($22,690), the JEOL 2000 ($16,800), and Microbrightfield StereoInvestigator, Neurolucida and Neurolucida 360 ($6,000).

Neuroscience Behavioral Core: The procedures for use and available equipment can be viewed at: http://www.uthsc.edu/neuroscience/behavioral-core/index.php. Due to the generally low cost of maintenance (PIs provide their own technicians to use the equipment), NI has not yet instituted fees for services in this facility.

Neuroscience Microtomy Core: The equipment available for use can be viewed at: http://www.uthsc.edu/neuroscience/imaging-center/microtomy.php.

Seminars and Symposia**:** Additional funds went to support travel/lodging/meals ($14,238) and honoraria ($2,800), for the Neuroscience Seminar series (see Appendix 3).

Research Projects*:* We provided startup funds for two faculty, Drs. Chizhikov and Ishrat, who were awarded $195,000 and $150,000, respectively. Dr. Chizhikov's has finished with his support effective Septmember 2018, and Dr. Ishrat's support, which began in February of 2018, may be spread over the next 3-5 years. Any unspent funds are reflected in our carryover.

Undergraduate Fellowships: NI supported 4 undergraduate Neuroscience Merit Fellows at $4000 each (total, $16,000) for summer research.

Travel Awards: $4,500 in travel awards for graduate students and postdoctoral fellows were awarded.

B. FY 2019. We will carryover $264,226 to the coming fiscal year, and have been appropriated $613,094 for a total of $877,320. In addition to providing support for all the NI staff (Program Coordinator, Administrative Assistant, and Imaging Center Manager), here is a breakdown of the major anticipated projects for FY2019:

Students: For the coming year, we have awarded matching funds for **4** graduate stipends to PIs with Neuroscience track graduate students. Mentors are located in the departments of Anatomy and Neurobiology, Neurology and Ophthalmology. The NI match is ~$14,500 each for 2 of these (~$29,500), and ~$7,600 for 2, (~$15,200), making an expected total of ~$44,200.

Postdoctoral Support: This year we will continue to provide funds for 4-6 postdoctoral fellows ($10,000-15,000 each for a total of ~$60,000 for the coming year). These will be given to postdoctoral awardees from last year since we typically fund 2 years. In addition, we have allotted another $30,000 for new postdoctoral fellows, bringing the total expected postdoctoral expenditures to $90,000 during FY 2019.

***Neuroscience Imaging Center*:** We will pay the service contracts on the JEOL 2000 ($16,800), for the Zeiss 710 Confocal ($22,689). Our Microbrightfield contract for the Neurolucida workstation is already paid for 2018. We have obligated $67,5000 to match with the Chancellor's gift to order the Airyscan upgrade to our Zeiss 710 confocal microscope (total: $135,000).

Neuroscience Behavioral Core: We will continue to support the Behavioral Core in FY2019, but expenditures are expected to be minimal. However, should a need arise for additional equipment, or for a part-time assistant to help run behavioral studies, NI would consider additional funding assuming a fee for service program were approved and initiated.

***Neuroscience Microtomy Core*:** Currently we have no contracts for any of the Microtomy Core equipment, but we repaired the Leica Cryostat this summer and the billing will go on FY 2019 for $2,500.

***NI Faculty*:** We will provide administrative supplements to Drs. Armstrong and Reiner. We are currently providing $150,000 over 3-5 years to faculty member Dr. Tauheed Ishrat (2/01//2018-1/31/2023), and have just committed $150,000 to a new recruit, Il Hwan Kim, Ph.D., over 3-5 years. Dr. Kim will arrive in March of 2019

so his support will run until 2024 should he choose to spread it over the full 5 years. We limit NI expenditures for each faculty at no more than $50,000/year, and request that they use at least $30,000 per year should they wish to extend the full five years. In addition, we may be obligated for a yet to be determined amount for another neuroscience recruit, Dr. Qian Sun. However, with the obligations to Drs. Ishrat and Kim, and to student and postdoctoral fellowships, the contribution to Dr. Sun will not exceed 50,000 over 5 years beginning 2019.

Research Projects and Bridge Funding: We can provide small amounts of bridge assistance, but this will be limited by our commitments to seed packages for previously recruited (Dr. Ishrat) and newly recruited (Dr. Kim) faculty.

Seminar Series and Community Outreach: We will offer our weekly Neuroscience Seminar series. We will continue to fund summer Undergraduate Neuroscience Merit Fellowships to Rhodes and Christian Brothers University students who are doing research projects in Neuroscience towards fulfilling their degree requirements (from 3-4 awards, depending on qualifications).

Schedule 7

CENTERS OF EXCELLENCE ACTUAL, PROPOSED, AND REQUESTED BUDGET

Institution: UNIVERSITY OF TENNESSEE HEALTH SCIENCE CENTER **Center:** NEUROSCIENCE

	FY 2017-18 Actual			FY 2018-19 Proposed			FY 2019-20 Requested		
	Matching	Appropr.	Total	Matching	Appropr.	Total	Matching	Appropr.	Total
Expenditures	**$833,179**	**$556,747**	**$1,389,926**	**$886,757**	**$877,320**	**$1,764,077**	**$913,360**	**$643,749**	**$1,557,109**
Salaries									
Faculty	$179,095	$8,310	**$187,405**	$184,468	$15,500	**$199,968**	$190,002	$5,000	**$195,002**
Other Professional	$40,564	$123,824	**$164,388**	$41,781	$127,539	**$169,320**	$43,034	$131,365	**$174,399**
Clerical/ Supporting	$178,688	$106,477	**$285,165**	$184,048	$109,568	**$293,616**	$189,570	$112,855	**$302,425**
Assistantships	$272,700	$129,151	**$401,851**	$309,463	$139,500	**$448,963**	$318,747	$120,000	**$438,747**
Total Salaries	**$671,047**	**$367,762**	**$1,038,809**	**$719,760**	**$392,107**	**$1,111,867**	**$741,353**	**$369,220**	**$1,110,573**
Longevity (Exclude from Salaries and include in Benefits)	$6,490	$3,459	**$9,949**	$6,685	$4,000	**$10,685**	$6,886	$4,500	**$11,386**
Fringe Benefits	$155,642	$102,198	**$257,840**	$160,312	$125,724	**$286,036**	$165,121	$129,496	**$294,617**
Total Personnel	**$833,179**	**$473,419**	**$1,306,598**	**$886,757**	**$521,831**	**$1,408,588**	**$913,360**	**$503,216**	**$1,416,576**
Non-Personnel									
Travel	$0	$13,342	**$13,342**	$0	$25,000	**$25,000**	$0	$27,000	**$27,000**
Software	$0	$6,336	**$6,336**	$0	$8,000	**$8,000**	$0	$1,000	**$1,000**
Books & Journals	$0	$0	**$0**	$0	$0	**$0**	$0	$0	**$0**
Other Supplies	$0	$35,617	**$35,617**	$0	$53,439	**$53,439**	$0	$52,183	**$52,183**
Equipment	$0	$0	**$0**	$0	$67,500	**$67,500**	$0	$0	**$0**
Maintenance	$0	$44,555	**$44,555**	$0	$55,000	**$55,000**	$0	$57,750	**$57,750**
Scholarships	$0	$0	**$0**	$0	$0	**$0**	$0	$0	**$0**
Consultants	$0	$0	**$0**	$0	$0	**$0**	$0	$0	**$0**
Renovation	$0	$0	**$0**	$0	$0	**$0**	$0	$0	**$0**
Other (Specify):									
Startup Funds	$0	$0	**$0**	$0	$150,000	**$150,000**	$0	$0	**$0**
Media Processing	$0	$135	**$135**	$0	$600	**$600**	$0	$600	**$600**
Communication	$0	$712	**$712**	$0	$950	**$950**	$0	$1,000	**$1,000**
Rentals & Insurance	$0	$2,371	**$2,371**	$0	$3,000	**$3,000**	$0	$3,000	**$3,000**
Contractual & Special Services	$0	$13,177	**$13,177**	$0	$20,000	**$20,000**	$0	$25,000	**$25,000**
Other Services & Expenditures	$0	-$38,321	**-$38,321**	$0	-$35,000	**-$35,000**	$0	-$35,000	**-$35,000**
Insurance & Interest	$0	$5,404	**$5,404**	$0	$7,000	**$7,000**	$0	$8,000	**$8,000**
Direct Cost Share	$0	$0	**$0**	$0	$0	**$0**	$0	$0	**$0**
Total Non-Personnel	**$0**	**$83,328**	**$83,328**	**$0**	**$355,489**	**$355,489**	**$0**	**$140,533**	**$140,533**
GRAND TOTAL	**$833,179**	**$556,747**	**$1,389,926**	**$886,757**	**$877,320**	**$1,764,077**	**$913,360**	**$643,749**	**$1,557,109**
Revenue									
New State Appropriation	$0	$601,491	**$601,491**	$0	$613,094	**$613,094**	$0	$643,749	**$643,749**
Carryover State Appropriation	$0	$219,483	**$219,483**	$0	$264,226	**$264,226**	$0	$0	**$0**
New Matching Funds	$833,179	$0	**$833,179**	$886,757	$0	**$886,757**	$913,360	$0	**$913,360**
Carryover from Previous Matching Funds	$0	$0	**$0**	$0	$0	**$0**	$0	$0	**$0**
Total Revenue	**$833,179**	**$820,974**	**$1,654,153**	**$886,757**	**$877,320**	**$1,764,077**	**$913,360**	**$643,749**	**$1,557,109**

X. FACULTY PUBLICATIONS

The Neuroscience faculty at UTHSC is consistently productive, both in terms of peer-reviewed publications and participation in the national neuroscience community. Lists of peer-reviewed journal publications during the last academic year, as cited in PubMed are presented in **Appendix 2**. These PubMed-cited publications do not include the many chapters, reviews and other articles written by NI faculty. NI faculty members are indicated in **bold** in **Appendix 2. NI members published ~210 papers!**

XI. EXTRAMURAL FUNDING OF NEUROSCIENCE FACULTY

The UT Neuroscience Institute is a concentrated, interdepartmental Neuroscience program. For FY2017-2018, Anatomy and Neurobiology (11 funded Neuroscientists) was ranked ***18th in the category of Neuroscience departments among public university medical schools in NIH funding (31st overall), and 24th among public university Anatomy and Cell Biology Departments (39th overall).*** Other participating NI departments that are well ranked include **Physiology** (6 funded NI members), which was ranked ***16th among public medical schools and 29th overall*** (of 83), and **Pharmacology** (6 funded members), ***ranked 43rd in public universities, and 70t overall*** (of 90) (Statistics from Blue Ridge Institute for Medical Research http://www.brimr.org/NIH_Awards/2017/NIH_Awards_2017.htm). The total annual grant dollars (total costs) currently held by faculty associated with the NI at UTHSC (*i.e.*, excluding affiliate members, such as St. Jude, and excluding grants in no cost extensions) is **$16,531,563.** The research grants (current year total costs) currently held by individual faculty of the NI are listed by Principal Investigator in **Appendix 1**. These values are reported to us by Research Administration at UTHSC. **Appendix 4** includes some examples of recently awarded faculty.

APPENDIX 1

External Funding of Neuroscience Institute Faculty

FY 2017-2018

Lead PI	Department	Project Title	Sponsor	Award Number	Begin Date	End Date	Total Amount
Baker, Jessica	Anatomy and Neurobiology	Evaluation of the genetic contribution of the neuroinflammatory response following neonatal alcohol exposure	HHS - NIH - NIAAA - National Institute on Alcohol Abuse and Alcoholism	1F31AA026498-01	12/1/2017	11/30/2018	$35,048
Boop, Frederick	Neurosurgery	Travel grant - 2018 AANS Annual Scientific Meeting	Medical Device Business Services INC	2018 AANS	4/28/2018	5/2/2018	$1,015
Boughter, John, ***Co PI Max Fletcher**	Anatomy and Neurobiology	Spatial taste coding in mouse gustatory cortex	HHS - NIH - NIDCD - National Institute on Deafness and Other Communication	1R01DC016833-01	5/1/2018	4/30/2019	$367,413
Bukiya, Anna	Pharmacology	Cholesterol control of alcohol-induced cerebral artery constriction	HHS - NIH - NIAAA - National Institute on Alcohol Abuse and Alcoholism	1R01AA023764-04	5/1/2018	4/30/2019	$342,000
Chen, Hao	Pharmacology	YoRodents: applying artificial intelligence to analyze rodent social behavior	University of Tennessee Research Foundation (UTRF)		1/2/2018	10/5/2018	$15,000
Chen, Hao	Pharmacology	Integrated GWAS of Complex Behavioral and Gene Expression Traits in Outbred Rats	University of California, San Diego (UCSD)	73257613 S9001369 5P50DA037844-05/05rev	5/1/2017	4/30/2018	$346,646
Chen, Hao	Pharmacology	Integrated GWAS of Complex Behavioral and Gene Expression Traits in Outbred Rats	University of California, San Diego (UCSD)	73257613 (PO# S9001369) Am4	1/1/2018	4/30/2018	$5,141
Chizhikov, Viktor	Anatomy and Neurobiology	Mesenchymal-neuroepithelial interactions in the developing telencephalon.	HHS - NIH - NINDS - National Institute of Neurological Disorders and	5R01NS093009-03	6/1/2018	5/31/2019	$335,966
Cordero-Morales, Julio	Physiology	The Role of Bioactive Lipids in Transient Receptor Potential Channels Gating	HHS - NIH - NIGMS - National Institute of General Medical Sciences	1R01GM125629-01	1/1/2018	12/31/2018	$304,000
Dopico, Alejandro	Pharmacology	Ethanol Actions on SLO Channels from Arteries vs. Brain	HHS - NIH - NIAAA - National Institute on Alcohol Abuse and Alcoholism	5 R37 AA011560-20	7/1/2017	6/30/2018	$371,171
Dragatsis, Ioannis	Physiology	Genetic modulators of 3-NP neurotoxicity	HHS - NIH - NIEHS - National Institute of Environmental Health Sciences	1R21ES028429-01	8/15/2017	7/31/2018	$228,000
Dragatsis, Ioannis	Physiology	Genetic modulators of 3-NP neurotoxicity	HHS - NIH - NIEHS - National Institute of Environmental Health Sciences	1R21ES028429-01	8/15/2017	7/31/2018	$228,000
Fletcher, Max	Anatomy and Neurobiology	Cholinergic modulation of olfactory bulb glomerular sensitivity	HHS - NIH - NIDCD - National Institute on Deafness and Other Communication	5R01DC013779-04	3/1/2018	2/28/2019	$319,044
Foehring, Robert	Anatomy and Neurobiology	Dynamics of Kv channel function in identified populations of pyramidal neurons in neocortex	HHS - NIH - NINDS - National Institute of Neurological Disorders and	2R01NS044163-14A1	2/1/2018	1/31/2019	$491,585
Gangaraju, Raja Shekhar	Ophthalmology	Vascular and Neuronal Repair with Adipose Stromal Cells in Retinopathy	HHS - NIH - NEI - National Eye Institute	5R01EY023427-05	4/1/2017	3/31/2018	$380,000
Hamre, Kristin, *** Co-PI Daniel Goldowitz, UBC, Candada**	Anatomy and Neurobiology	Maternal genotype, choline intervention, & epigenetics in Fetal Alcohol Syndrome	HHS - NIH - NIAAA - National Institute on Alcohol Abuse and Alcoholism	5R01AA023508-03 Revised	3/1/2018	2/28/2019	$29,618
Hamre, Kristin, *** Co-PI Daniel Goldowitz, UBC, Candada**	Anatomy and Neurobiology	Maternal genotype, choline intervention, & epigenetics in Fetal Alcohol Syndrome	HHS - NIH - NIAAA - National Institute on Alcohol Abuse and Alcoholism	5R01AA023508-03	3/1/2018	2/28/2019	$266,548
Han, Joan	Pediatrics-Obesity	Subaward: Melanocortin agonist to bypass leptin resistance of Bardet-Biedl Syndrome	Jackson Laboratory	210260 3R01DK102918-04S1	5/1/2018	5/31/2018	$60,800
Han, Joan	Pediatrics-Obesity	Salary support for Joan Han	Memphis Research Consortium		7/1/2017	6/30/2018	$268,500
Han, Joan	Pediatrics-Obesity	Start-up Funds	Memphis Research Consortium		7/1/2017	6/30/2018	$50,000
Heck, Detlef	Anatomy and Neurobiology	Neuronal mechanisms of cerebellar cognitive function	HHS - NIH - NIMH - National Institute of Mental Health	1R01MH112143-01A1	4/1/2018	12/31/2018	$414,470
Hori, Rod, ***Co-PI Mark Ledoux**	Microbiology and Immunology	The Role of UBTF in Undiagnosed Neurodevelopmental Disorders	HHS - NIH - NINDS - National Institute of Neurological Disorders and	5R21GM118962-02	1-May-17	30-Apr-18	$228,000
Ishrat, Tauheed	Anatomy and Neurobiology	Mechanisms and therapeutic targets of neurovascular injury in hyperglycemic stroke	HHS - NIH - NINDS - National Institute of Neurological Disorders and	7R01NS097800-03	6/1/2018	5/31/2019	$332,500
Jablonski, Monica	Ophthalmology	Extended release formulation of pregabalin: a new glaucoma therapy	University of Tennessee Research Foundation (UTRF)		1/2/2018	10/5/2018	$15,000
Jablonski, Monica	Ophthalmology	Extended Release IOP-Lowering Formulation	Glaucoma Research		3/1/2018	2/28/2019	$40,000
Jablonski, Monica	Ophthalmology	Evaluation and inhibition of efflux pumps expressed on the blood ocular barrier.	University of Mississippi (UM)	15-03-031 1R01EY022120-01A1 Mod 3	########	2/28/2018	$6,992
Jablonski, Monica	Ophthalmology	Evaluation and inhibition of efflux pumps expressed on the blood ocular barrier.	University of Mississippi (UM)	UMsub 15-03-031 Mod 4 1R01EY022120-01A1	4/10/2018	2/28/2019	$63,412
Jablonski, Monica	Ophthalmology	Dutch Belted Rabbit Efficacy/Tolerability Model	Tisbury Pharmaceuticals LTD		5/24/2017	5/23/2018	$26,400
Jaggar, Jonathan	Physiology	Blood pressure regulation by smooth muscle cell ion channels	HHS - NIH - NHLBI - National Heart, Lung, and	5R01HL133256-02	4/1/2018	3/31/2019	$372,400
Jaggar, Jonathan	Physiology	Endothelial cell potassium channels	HHS - NIH - NHLBI - National Heart, Lung, and	1R01HL137745-01	7/1/2017	6/30/2018	$490,268
Jones, Byron, ***Co-PI Lu Lu**	Genetics, Genomics & Informati	Neural Toxicity of Paraquat is Related to Iron Regulation in Midbrain	HHS - NIH - NIEHS - National Institute of Environmental Health Sciences	5R01ES022614-06	5/1/2018	4/30/2019	$460,929
Jones, Byron, ***Co-PI Lu Lu**	Genetics, Genomics & Informati	Neural Toxicity of Paraquat is Related to Iron Regulation in Midbrain	HHS - NIH - NIEHS - National Institute of Environmental Health Sciences	3R01ES022614-06S1	5/22/2018	4/30/2019	$5,460
Jones, Byron, ***Co-PI Lu Lu**	Genetics, Genomics & Informati	Genetics of Chronic Mild Stress and Alcohol Consumption	HHS - NIH - NIAAA - National Institute on Alcohol Abuse and Alcoholism	5R01AA021951-04	9/1/2017	8/31/2018	$375,169
Jones, Byron, ***Co-PI Lu Lu**	Genetics, Genomics & Informati	Genetic Basis of Individual Differences in Susceptibility to Gulf War Illness	DOD - Department of Defense	W81XWH-17-1-0472	8/15/2017	8/14/2020	$756,071
Kita, Hitoshi	Anatomy and	Synaptic Transmissions in the Basal Ganglia	HHS - NIH - NINDS -	5 R01 NS057236-10	5/1/2018	4/30/2019	$328,125

Lead PI	Department	Project Title	Sponsor	Award Number	Begin Date	End Date	Total Amount
Ledoux, Mark	Neurology	An open-label study of nelotanserin in patients with Lewy body dementia who have frequent visual hallucinations or REM sleep behaviors. RVT 102-2003	Axovant Sciences, Inc.	RVT-102-2003	########	5/31/2019	$167,560
Ledoux, Mark	Neurology	A Randomized Double-Blind, Placebo-Controlled, Phase IIa, Parallel Group, Two-Cohort Study to Define the Safety, Tolerability, Clinical and Exploratory Biological Activity of the Chronic Administration of Nilotinib in Participants with Parkinson'sNilo PD	Northwestern University	NILO PD MJFF Grant ID No. 14549	1/9/2018	1/9/2021	$118,725
Ledoux, Mark	Neurology	Mouse Models of Paroxysmal Non-kinesigenic Dyskinesia	HHS - NIH - NINDS - National Institute of Neurological Disorders and	1R03NS101485-01A1	4/1/2018	3/31/2019	$76,000
Ledoux, Mark	Neurology	Study to develop a resource of data and biomaterials that will be of interest to investigators for future studies. Natural History vs.	Emory University	5U54TR001456	6/30/2017	8/31/2019	$0
Ledoux, Mark	Neurology	A randomized, double-blind, placebo-controlled trial of urate-elevating inosine treatment to slow clinical decline in early Parkinson's disease	Massachusetts General Hospital	5U01NS090259-03 Mod 4	3/8/2018	6/30/2018	$2,236
Ledoux, Mark	Neurology	Pathophysiology of Paroxysmal Dyskinesias	HHS - NIH - NINDS - National Institute of Neurological Disorders and	1R56NS094965-01A1	9/22/2017	8/31/2018	$438,136
Ledoux, Mark	Neurology	Observational Study to Determine the Presence of Single Nucleotide Polymorphisms rs362307 (T/C) and rs362331 (T/C) in Patients with Huntington's Disease,	Wave Life Sciences, Ltd.	rs362507 and rs362331	8/10/2017	8/10/2018	$19,650
Leffler, Charles	Physiology	Hydrogen Sulfide in Newborn Cerebral Circulation	HHS - NIH - NHLBI - National Heart, Lung, and	2 R01 HL042851-27	1/1/2018	12/31/2018	$385,608
Li, Wei, * **Co-PI Duane Miller**	Pharmaceutical Sciences	Targeting the colchicine site in tubulin for advanced melanoma	HHS - NIH - NCI - National Cancer Institute	5R01CA148706-08	1/1/2018	12/31/2018	$328,942
Li, Wei, * **Co-PI Duane Miller**	Pharmaceutical Sciences	Targeting the colchicine site in tubulin for advanced melanoma	HHS - NIH - NCI - National Cancer Institute	5R01CA148706-08 Revised	1/1/2018	12/31/2018	$36,551
Liao, Francesca-Fang	Pharmacology	Is HSF1 the key in mediating Hsp90 inhibitor effect in AD?	HHS - NIH - NIA - National Institute on Aging	5R01AG049772-04	5/1/2018	4/30/2019	$280,440
Liao, Francesca-Fang	Pharmacology	Is dysfunctional eNOS a major contributing factor for sporadic	Alzheimer's Association	ZEN-16-362441	3/1/2017	2/28/2018	$150,000
Liao, Francesca-Fang	Pharmacology	Is dysfunctional eNOS a major contributing factor for sporadic	Alzheimer's Association	ZEN-16-362441	3/1/2018	2/28/2019	$150,000
Malik, Kafait	Pharmacology	Angiotensins, Prostaglandins, Adrenergic Interactions	HHS - NIH - NHLBI - National Heart, Lung, and	2R01HL019134-43	6/1/2018	5/31/2019	$717,765
Mandal, Nawajes	Ophthalmology	Anti-ceramide Gene Therapy for Retinal Neurodegeneration	Research to Prevent Blindness		7/1/2017	6/30/2018	$75,000
McDonald, Michael, *Co-PI Francesca-Fang	Neurology	Effects of modified erythropoietin on cognitiion and neuropathology	HHS - NIH - NIA - National Institute on Aging and NINDS	5R01NS094595-03	7/1/2017	5/31/2018	$380,606
McDonald, Michael	Neurology	Effects of glycomacropeptide on memory and Alzheimer-related neuropath	HHS - NIH - NIA - National Institute on Aging	1R01AG054562-02	4/1/2018	3/31/2019	$380,000
Morales-Tirado, Vanessa	Ophthalmology	Retinal Inflammasomes Mediate Ganglion Cell Death in Glaucoma	William and Ella Owens Medical Research Foundation		2/1/2017	1/31/2018	$150,000
Mozhui, Khyobeni	Preventive medicine	DNA methylation and gene expression study of aging and lifespan differences	HHS - NIH - NIA - National Institute on Aging	1R21AG055841-01	9/15/2017	4/30/2018	$266,000
Neuner, Sarah	Anatomy and Neurobiology	Identification of Genetic Modifiers of Neuronal Deficits and Memory Failure in Alzheimer?s Disease.	HHS - NIH - NIA - National Institute on Aging	5F31AG050357-03	7/1/2017	6/30/2018	$43,576
Parfenova, Elena	Physiology	Astrocyte functions in neonatal brain	HHS - NIH - NINDS - National Institute of Neurological Disorders and	1R01NS101717-01	7/1/2017	6/30/2018	$332,500
Parfenova, Elena	Physiology	Hydrogen Sulfide in Newborn Cerebral Circulation	HHS - NIH - NHLBI - National Heart, Lung, and	5R01HL042851-27	1/1/2018	12/31/218	$393,478
Reiner, Anton	Anatomy and Neurobiology	Neural Control of Choroidal Blood Flow in the Eye	HHS - NIH - NEI - National Eye Institute	5 R01 EY005298-28	9/30/2017	8/31/2018	$380,000
Reiter, Lawrence	Neurology	Gene Expression Analysis in PWS Subject Derived Dental Pulp Stem Cell Neurons.	Foundation for Prader -Willi Research	Amendment 2	7/1/2017	1/31/2018	$10,755
Reiter, Lawrence	Neurology	An in vivo chemical screen for seizure suppression in Duplication 15q syndrome.	HHS - NIH - NICHD - Eunice Kennedy Shriver National Institute of Child Health and Human Development	1R21HD091541-02	4/1/2018	3/31/2019	$205,200
Reiter, Lawrence	Neurology	An in vivo chemical screen for seizure suppression in Duplication 15q syndrome.	HHS - NIH - NICHD - Eunice Kennedy Shriver National Institute of Child Health and Human Development	1R21HD091541-02 REVISED	4/1/2018	3/31/2019	$22,800
Yao Sun, *Lu Lu	Medicine-cardiology	Genetic Modulation of Hypertrophic Cardiomyopathy Severity	HHS - NIH - NHLBI - National Heart, Lung, and	5R01HL128350-03	5/1/2018	4/30/2019	$498,019
Vasquez, Valeria	Physiology	Studying prolonged nociceptors activation by TRPV1 combining a spider toxin and C. elegans	US-Israel Binational Science Foundation	2015221	9/1/2017	8/31/2018	$38,200
Williams, Robert	Genetics, Genomics & Informati	ACE Project GGI	Memphis Research Consortium		7/1/2017	6/30/2018	$134,413
Williams, Robert	Genetics, Genomics & Informatics	A Unified High Performance Web Service for Systems Genetics and Precision Medicine	HHS - NIH - CSR - National Center for Scientific Review	1R01GTM123489-02	4/1/2018	3/31/2019	$429,086
Williams, Robert	Genetics, Genomics & Informatics	A Unified High Performance Web Service for Systems Genetics and Precision Medicine	HHS - NIH - CSR - National Center for Scientific Review	1R01GTM123489-02 REVISED	4/1/2018	3/31/2019	$47,678
Williams, Robert	Genetics, Genomics & Informati	Systems Control of Normal Aging and Alzheimer's Disease	Jackson Laboratory	TBI	5/15/2017	4/30/2018	$18,822
Williams, Robert	Genetics, Genomics & Informati	Systems Control of Normal Aging and Alzheimer's Disease	Jackson Laboratory	210262 Am1 5R01AG054180-02	7/1/2018	4/30/2019	$18,822
Williams, Robert	Genetics, Genomics & Informatics	NIDA Core	HHS - NIH - NIDA - National Institute on Drug Abuse	1P30DA044223-01	8/1/2017	5/31/2018	$906,404

Lead PI	Department	Project Title	Sponsor	Award Number	Begin Date	End Date	Total Amount
Youngentob, Steven	Anatomy and Neurobiology	Developmental Exposure Alcohol Research Center	Binghamton University State Univeristy of New York (SUNY)	79050-1141746-UTenn	9/1/2017	8/31/2018	$235,400
Zhou, Fuming	Pharmacology	Ion channel mechanisms of striatal dopaminergic motor stimulation	HHS - NIH - NINDS - National Institute of Neurological Disorders and	5R01NS097671-03	5/1/2018	4/30/2019	$299,250
Zhou, Fuming	Pharmacology	Ion channel mechanisms of striatal dopaminergic motor stimulation	HHS - NIH - NINDS - National Institute of Neurological Disorders and	5R01NS097671-03 RE#VISED	5/1/2018	4/30/2019	$33,250
TOTAL							**$16,531,563**

*denotes co-principal investigator

APPENDIX 2

Faculty Publications (PubMed)

FY 2017-2018

Peer-reviewed publications for 2017-2018 (cited in PubMed):

Abidi, A. H., Presley, C. S., Dabbous, M., Tipton, D. A., Mustafa, S. M., & **Moore, B. M., 2nd.** (2018). Anti-inflammatory activity of cannabinoid receptor 2 ligands in primary hPDL fibroblasts. *Arch Oral Biol, 87*, 79-85. doi:10.1016/j.archoralbio.2017.12.005

Ahmed, H. A., **Ishrat, T.**, Pillai, B., Bunting, K. M., Patel, A., Vazdarjanova, A., Waller, J. L., Arbab, A. S., Ergul, A., & Fagan, S. C. (2018). Role of angiotensin system modulation on progression of cognitive impairment and brain MRI changes in aged hypertensive animals - A randomized double- blind pre-clinical study. *Behav Brain Res, 346*, 29-40. doi:10.1016/j.bbr.2017.12.007

Ajayi, O. J., Smith, E. J., Viangteeravat, T., Huang, E. Y., Nagisetty, N., Urraca, N., Lusk, L., Finucane, B., Arkilo, D., Young, J., Jeste, S., Thibert, R., Dup15q, A., & **Reiter, L. T.** (2017). Multisite Semiautomated Clinical Data Repository for Duplication 15q Syndrome: Study Protocol and Early Uses. *JMIR Res Protoc, 6*(10), e194. doi:10.2196/resprot.7989

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Annunziata, I., Sano, R., & **d'Azzo, A.** (2018). Mitochondria-associated ER membranes (MAMs) and lysosomal storage diseases. *Cell Death Dis, 9*(3), 328. doi:10.1038/s41419-017-0025-4

Arnst, K. E., Wang, Y., Hwang, D. J., Xue, Y., Costello, T., Hamilton, D., Chen, Q., Yang, J., Park, F., Dalton, J. T., **Miller, D. D.**, & Li, W. (2018). A Potent, Metabolically Stable Tubulin Inhibitor Targets the Colchicine Binding Site and Overcomes Taxane Resistance. *Cancer Res, 78*(1), 265-277. doi:10.1158/0008-5472.CAN-17-0577

Ashbrook, D. G., **Mulligan, M. K.**, & **Williams, R. W.** (2018). Post-genomic behavioral genetics: From revolution to routine. *Genes Brain Behav, 17*(3), e12441. doi:10.1111/gbb.12441

Azumaya, C. M., Sierra-Valdez, F., **Cordero-Morales, J. F.**, & Nakagawa, T. (2018). Cryo-EM structure of the cytoplasmic domain of murine transient receptor potential cation channel subfamily C member 6 (TRPC6). *J Biol Chem, 293*(26), 10381-10391. doi:10.1074/jbc.RA118.003183

Babajani-Feremi, A., Holder, C. M., **Narayana, S.**, Fulton, S. P., Choudhri, A. F., **Boop, F. A.**, & **Wheless, J. W.** (2018). Predicting postoperative language outcome using presurgical fMRI, MEG, TMS, and high gamma ECoG. *Clin Neurophysiol, 129*(3), 560-571. doi:10.1016/j.clinph.2017.12.031

Ban, D., Iconaru, L. I., Ramanathan, A., **Zuo, J.**, & Kriwacki, R. W. (2017). A Small Molecule Causes a Population Shift in the Conformational Landscape of an Intrinsically Disordered Protein. *J Am Chem Soc, 139*(39), 13692-13700. doi:10.1021/jacs.7b01380

Banerjee, S., Arnst, K. E., Wang, Y., Kumar, G., Deng, S., Yang, L., Li, G. B., Yang, J., White, S. W., Li, W., & **Miller, D. D.** (2018). Heterocyclic-Fused Pyrimidines as Novel Tubulin Polymerization Inhibitors Targeting the Colchicine Binding Site: Structural Basis and Antitumor Efficacy. *J Med Chem, 61*(4), 1704-1718. doi:10.1021/acs.jmedchem.7b01858

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Blundon, J. A., Roy, N. C., Teubner, B. J. W., Yu, J., Eom, T. Y., Sample, K. J., Pani, A., Smeyne, R. J., Han, S. B., Kerekes, R. A., Rose, D. C., Hackett, T. A., Vuppala, P. K., Freeman, B. B., 3rd, & **Zakharenko, S. S.** (2017). Restoring auditory cortex plasticity in adult mice by restricting thalamic adenosine signaling. *Science, 356*(6345), 1352-1356. doi:10.1126/science.aaf4612

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APPENDIX 3

Neuroscience Seminar Speakers

FY 2017-2018

THE NEUROSCIENCE INSTITUTE
UNIVERSITY OF TENNESSEE HEALTH SCIENCE CENTER

NEUROSCIENCE SEMINAR SERIES SCHEDULE

Fall 2017

Peter Larsson, Ph.D. — September 12, 2017
Professor
Department Physiology and Biophysics
University of Miami Miller School of Medicine
Host: Dr. Alex Dopico

Title: "Polyunsaturated Fatty Acids as possible Long QT Syndrome treatment"

Paul Axelsen, M.D. — September 19, 2017
Professor
Department of Pharmacology, Biochemistry, Biophysics and Medicine
University of Pennsylvania School of Medicine
Host: Dr. Anna Bukiya

Title: "Critical Questions about Nature of Oxidative Stress in Alzheimer's Disease, and a few Answers"

Sudha Chakrapani, Ph.D. — September 26, 2017
Associate Professor
Department of Physiology and Biophysics
Case Western Reserve University
Host: Dr. Valeria Vasquez

Title: "Modulation of Pentameric Ligand-Gated Ion Channel Gating by Membrane Lipids"

Detlef Heck, Ph.D. — October 3, 2017
Associate Professor
Department of Anatomy and Neurobiology
UTHSC

Title: "TBA"

Michael Elliott, Ph.D. — October 10, 2017
Associate Professor
Department of Ophthalmology
University of Oklahoma Health Sciences Center
Host: Dr. Nawajes Mandal

Title: "Seeing the light in Caves: Caveolae Functions in the Visual Systems"

Anna Bukiya, Ph.D. — October 17, 2017
Assistant Professor
Department of Pharmacology
UTHSC

Title: "Cholesterol and alcohol modulation of cerebral artery diameter"

Lindsay Schwartz, Ph.D. — October 24, 2017
Assistant Professor
Department of Developmental Neurobiology
St. Jude Children's Research Hospital
Host: Dr. Bill Armstrong

Title: "Uncovering diversity in brain norepinephrine circuits"

October 31, 2017

"TBA"

Danielle Reed, Ph.D. November 7, 2017
Associate Director
Department of Genetics
Monell Chemical Senses Center
Host: Dr. John Boughter

Title: "Beyond bitter taste: many roles for TAS2R38"

Alecia Gross Gutierrez, Ph.D. November 28, 2017
Associate Professor
Department of Vision Sciences
University of Alabama at Birmingham
Host: Dr. Anton Reiner

Title: "Program trafficking and retinal disease"

Baoji Xu, Ph.D. December 5, 2017
Professor
Department of Neuroscience
The Scripps Research Institute Florida
Host: Dr. Joan Han

Title: "Central regulation of food intake and body weight through BDNF-TrkB signaling"

Steve Tavalin, Ph.D. December 12, 2017
Associate Professor
Department of Pharmacology
UTHSC

Title: "TBA"

THE NEUROSCIENCE INSTITUTE
UNIVERSITY OF TENNESSEE HEALTH SCIENCE CENTER

Neuroscience Seminar Series Schedule

Spring 2018

Peyman Golshani, MD, PhD — Host: Larry Reiter — January 23, 2018
Associate Professor
Department of Neurobiology
UC Irvine
Title: "Bridging the gap between synaptic physiology and behavior: new tools to measure network dynamics in health and disease"

James Handa, PhD — Host: Monica Jablonski — February 6, 2018
Professor
Department of Ophthalmology
Johns Hopkins Medicine
Title: "Are the RPE changes to Degeneration or EMT in AMD?"

Julian Meeks, PhD — Host: Max Fletcher — February 20, 2018
Assistant Professor
Department of Neuroscience, Neurology & Neurotherapeutics
University of Texas Southwestern Medical Center
Title: "Accessory olfactory bulb interneurons in chemosensory processing and plasticity"

Jonathan Jaggar, PhD — February 27, 2018
Endowed Professor
Department of Physiology
UTHSC
Title: TBA

Keri Martinowich, PhD — Host: Joan Han — March 6, 2018
Associate Professor
Department of Psychiatry; Neuroscience
Johns Hopkins Medicine
Title: TBA

Hao Chen, PhD — March 13, 2018
Assistant Professor
Department of Pharmacology
UTHSC
Title: TBA

Ilyz Bezprozvanny, PhD — Host: Francesca-Fang Liao — March 20, 2018
Professor
Department of Physiology
University of Texas Southwestern Medical Center
Title: TBA

John Boughter, Jr., PhD — March 27, 2018
Associate Professor
Department of Anatomy & Neurobiology
UTHSC
Title: TBA

Steven Tavalin, PhD — April 10, 2018
Associate Professor
Department of Pharmacology
UTHSC
Title: TBA

Ryan Drenan, MD, PhD — Host: Fu-Ming Zhou — April 17, 2018
Associate Professor
Department of Pharmacology
Northwestern University
Title: "Hitting the PA-Nic switch: a new optical approach for nicotinic receptor studies"

Tao Xie, MD, PhD — Host: Angela Taylor — April 24, 2018
Associate Professor
Department of Neurology
Director of Parkinson's Disease & Deep Brain Stimulation
University of Chicago Medical Center
Title: TBA

Danielle Reed, PhD — Host: John Boughter, Jr. — May 1, 2018
Associate Professor
Department of Genetics
Monell Chemical Senses Center
Title: "Beyond bitter taste: many roles for TAS2R38"

Bill Carlezon, PhD — Host: Hao Chen — May 8, 2018
Chief, Basic Neuroscience
Director, Behavioral Genetics Lab
Professor
Department of Psychiatry
Harvard Medical School
Title: TBA

Claus Hilgetag, PhD — Host: Jack Tsao — May 15, 2018
Adjunct Associate Professor of Health Sciences
Boston University
Associate Professor
Department of Neuroscience
School of Engineering & Science
Jacobs University, Germany
Title: TBA

APPENDIX 4

Neuroscience News, Events and Graduate Training Flyer

FY 2017-2018

6 The Research Rainmaker

Researcher Spotlight: Graduate Student Jessica Baker

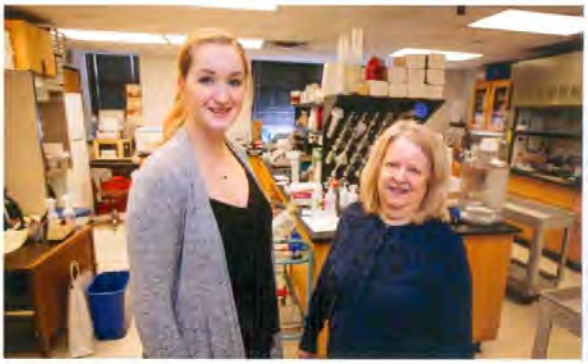
Third-year College of Graduate Health Science student Jessica Baker, BS, was recently selected as a recipient of a National Institutes of Health award for her project titled, "Evaluation of the Genetic Contribution of the Neuroinflammatory Response Following Neonatal Alcohol Exposure." The fellowship award will support Baker's work as a neuroscience student where she focuses on the effects of alcohol syndrome on the brain.

"Fetal alcohol spectrum disorders (FASD) refers to a group of conditions which affects two to five percent of children in the US annually," said Baker. "These effects can include cognitive deficits such as learning disabilities, hyperactivity, and poor memory. My work aims to investigate the intersection of genetics and alcohol-induced neroinflammation in the hopes it will lead to a better understanding and treatment options."

Baker's F31 award stems from the research she does under the direction of Kristin Hamre, PhD, associate professor in the department of Anatomy and Neurobiology at UTHSC. Specifically, in September 2016, Dr. Hamre and Cynthia Kane, PhD, professor at the University of Arkansas for Medical Sciences (UAMS) were selected as the recipients of the first UTHSC/UAMS USA Collaborative Research Network (CORNET) Award in Substance Abuse. The CORNET award was used to fund their study titled, "The Role of Genetics in the Neuroimmune Response to Developmental Alcohol Exposure in the Hippocampus."

"The immune system has a big impact on brain development," said Dr. Hamre. "We are looking at the roles that genetics play, as well as inflammation in the developing fetal brain. The CORNET Award allowed us to show that we had an active collaboration and strong institutional support for this collaboration, both of which were essential in helping us get Jessica's fellowship."

Drs. Kane and Hamre have known each other for a number of years and saw the CORNET Award as their opportunity to finally collaborate. Since receiving their CORNET Award, Dr. Hamre's team has traveled to UAMS to do training with Dr. Kane's lab. The pair plan to use the data collected with the help of their CORNET Award to submit an application for federal funding in the future.



Jessica Baker (left) and Dr. Kristin Hamre (right)

For Jessica, receiving an F31 Award will help her complete her thesis work being done in Dr. Hamre's lab. She will receive funding over the next three-year period.

Let's Connect!
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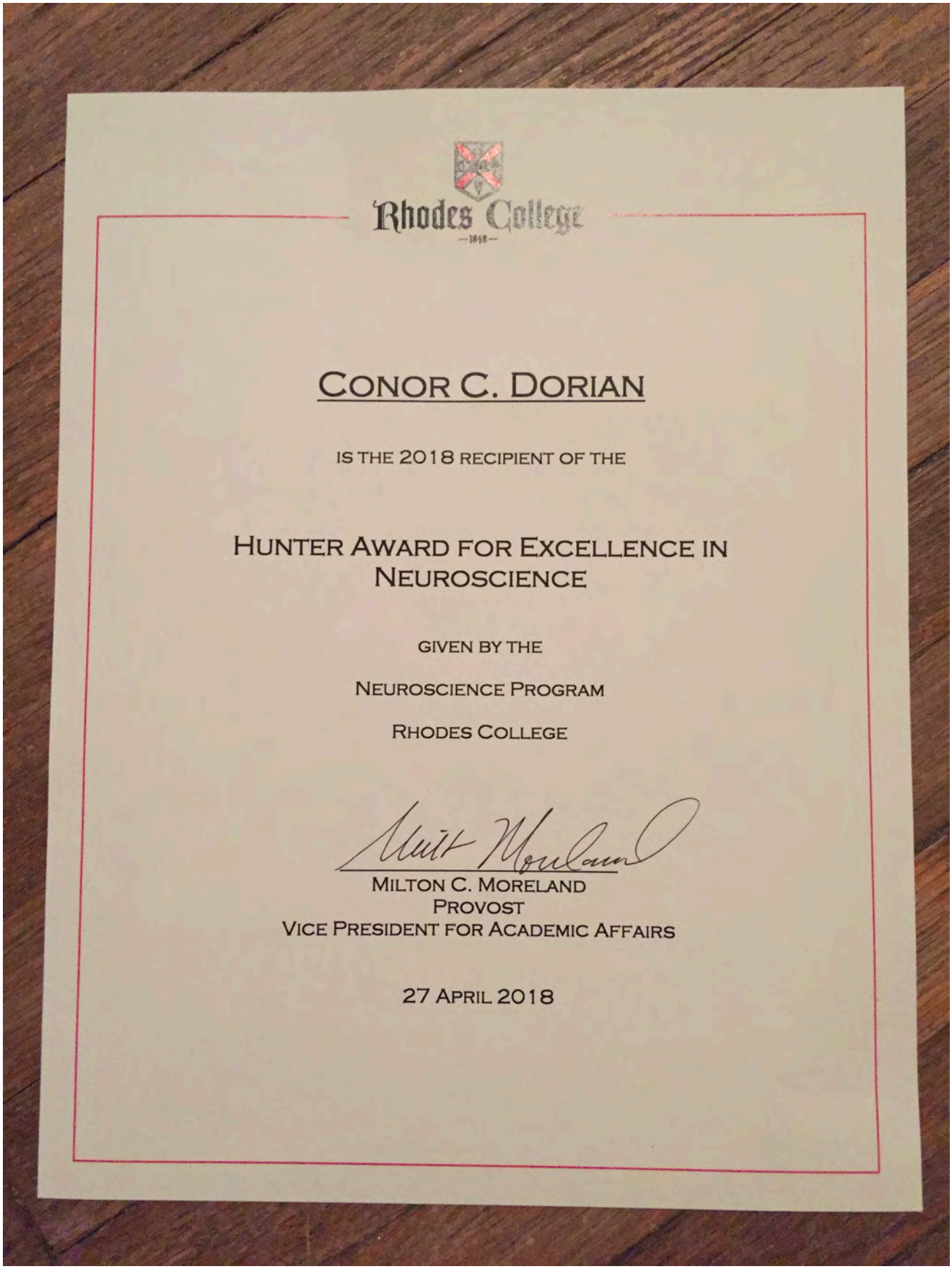

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27 APRIL 2018

Boughter and Fletcher of UTHSC Receive $2.27 Million Grant for Research Offering Insights into Link Between Taste and Behavior

Written by Connor Bran | August 24, 2018

Drs. Boughter and Fletcher received a five-year $2.27 million grant through the National Institutes of Health. (Photo by Connor Bran/UTHSC)

Dietary decisions play a vital role in the progression of a number of human conditions (obesity, diabetes, anorexia, hypertension, coronary artery disease, etc.), and arguably the most important factor regulating these decisions is the sense of taste. New research from University of Tennessee Health Science Center (UTHSC) scientists John D. Boughter, Jr., PhD, and Max Fletcher, PhD, explores how this important sensory system is organized in the brain, and how it works to modify behavioral patterns.

"The general idea is that it's a project to map sensory representation in the cortex," said Dr. Boughter, associate professor of Anatomy and Neurobiology at UTHSC. The duo is accomplishing this aim by using a cutting-edge brain imaging technique called two-photon imaging with animal models, recording a mouse's brain activity as it tastes and feeds. "This is basically a technique that allows you to look at individual neurons and how they respond to stimuli in real-time, and do it in a very spatially precise manner," said Dr. Boughter.

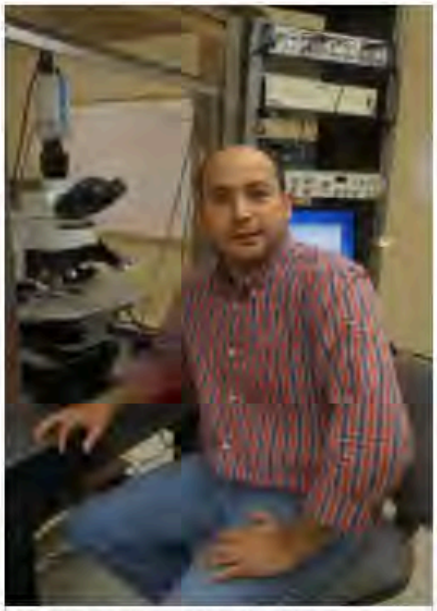
Their project, entitled "Spatial taste coding in mouse gustatory cortex," has received a five-year $2.27 million grant through the National Institutes of Health.

The part of the brain Drs. Boughter and Fletcher are focusing on, the gustatory cortex, is extremely difficult to access. Located on the lateral surface of the brain, the gustatory cortex is a region where the sense of taste and its reactive neurons are stored. What's more, Boughter and Fletcher are on the forefront of this research, as at the time of their grant submission, only one other paper had been published on the topic.

The clinical significance of this research is that it should provide important clues into how eating and feeding behavior are organized in the brain. "Understanding how information is organized and encoded there hopefully will give us some really good insights into the function of this part of the cortex and how exactly its related to eating behavior in humans," said Dr. Boughter.

Cordero-Morales Awarded $1.5 Million to Study How Dietary Fatty Acids Regulate TRP Channel Function

Written by Connor Bran | February 20, 2018



Dr. Julio Cordero-Morales (Photo provided by UTHSC Office of Research)

Julio Cordero-Morales, PhD, assistant professor in the Department of Physiology in the College of Medicine at the University of Tennessee Health Science Center (UTHSC), has recently been awarded $1,520,000 to study the molecular basis by which dietary fatty acids — such as omega-3 and omega-6 — regulate the function of membrane proteins present in the vascular system, called transient receptor potential channels (TRP channels).

"Although dietary consumption of omega-3 fatty acids is known to have beneficial cardiovascular effects, the mechanisms and protein targets by which this occurs remain largely unknown," Dr. Cordero-Morales said. Through extensive research, Dr. Cordero-Morales and his team have found that omega-3 fatty acids regulate the function of a specific TRP channel known as TRPV4. "Other groups have shown that TRPV4 plays an important role in reducing blood pressure. Once the precise mechanism by which TRPV4 is activated is established, it will be possible to define strategies that target TRPV4 to control systemic blood pressure."

This grant, given to Dr. Cordero-Morales from the National Institutes of Health (NIH), paves the way for five years of funding to continue his research project entitled, "The Role of Bioactive Lipids in Transient Receptor Potential Channels Gating."

In preliminary research using Caenorhabditis elegans, an animal model that can be genetically deprived of fatty acids, Dr. Cordero-Morales and his team discovered that a class of omega-3 fatty acids played important roles in protein function. "Once we discovered that omega-3 fatty acids were important, we moved to the second phase and studied the effect of fatty acids on TRPV4 channels present in human vascular endothelial cells." Understanding the mechanism by which fatty acids regulate TRPV4 in these cells is key in generating novel therapeutics strategies to target this protein.

Based on his training as a biophysicist and physiologist, the third part of Dr. Cordero-Morales' project is focused on understanding the detailed mechanism by which fatty acids regulate TRPV4 using biophysical approaches. It is expected that the combination of these interdisciplinary approaches will spearhead the way to understanding how fatty acids and other lipids regulate membrane proteins in the vascular system.

Jablonski Selected as First User of UTHSC Innovation Lab Space

Written by Sarah Ashley Fenderson | January 24, 2018

Monica Jablonski (Photo by Thurman Hobson/UTHSC)

Monica M. Jablonski, PhD, professor in the Department of Ophthalmology in the College of Medicine at the University of Tennessee Health Science Center (UTHSC), has been selected as the first user of the UTHSC Innovation Lab space. The UTHSC Innovation Lab will allow Dr. Jablonski to further develop an ophthalmic microemulsion designed to combat the shortcomings traditionally linked to standard eye drops and improve treatment efficacy in certain ophthalmic diseases.

Thanks to a recent partnership between Memphis Bioworks Foundation and UTHSC, the 420 square-foot turnkey space will be available to Dr. Jablonski for up to 12 months, at no cost to her, as she develops her intellectual property (IP) in anticipation submitting a Small Business Innovation Research (SBIR) and/or Small Business Technology Transfer (STTR) proposal. During the 12-month period of occupancy in the Memphis Bioworks building, Dr. Jablonski will have access to standard lab equipment (e.g., tissue culture hood), services, as well as consulting. New companies using the Innovation Lab will be required to submit at least one SBIR and/or STTR grant application during the year of occupancy.

"We have successfully prepared, optimized and characterized an extended release, multilayered, bioadhesive, topical microemulsion-based formulation for delivery of hydrophilic drugs to the posterior pole of the eye," said Dr. Jablonski. "Our microemulsion is designed to overcome the drawbacks associated with traditional eye drops that include rapid drainage, short corneal contact time and minimal corneal penetration, all of which lead to reduced efficacy and poor patient compliance. The availability of the UTHSC Innovation Lab space will allow us to focus on further developing this formulation so that we can increase our chances of success in obtaining SBIR or STTR funds from NIH. In addition, the business development mentoring that is also provided with the lab space will be invaluable to us as we navigate through the business world. I am honored to have been selected."

Glaucoma affects more than three million people in the United States and accounts for over ten million visits to physicians each year. Researchers predict that with the increased longevity of the U.S. population, the number of people affected by Glaucoma could increase to 6.3 million by 2050. Dr. Jablonski anticipates that her technology will have a large impact on the treatment of ophthalmic diseases as the novel therapeutic can reach deep into the eye delivering anti-glaucoma agents to hard-to-reach target cells.

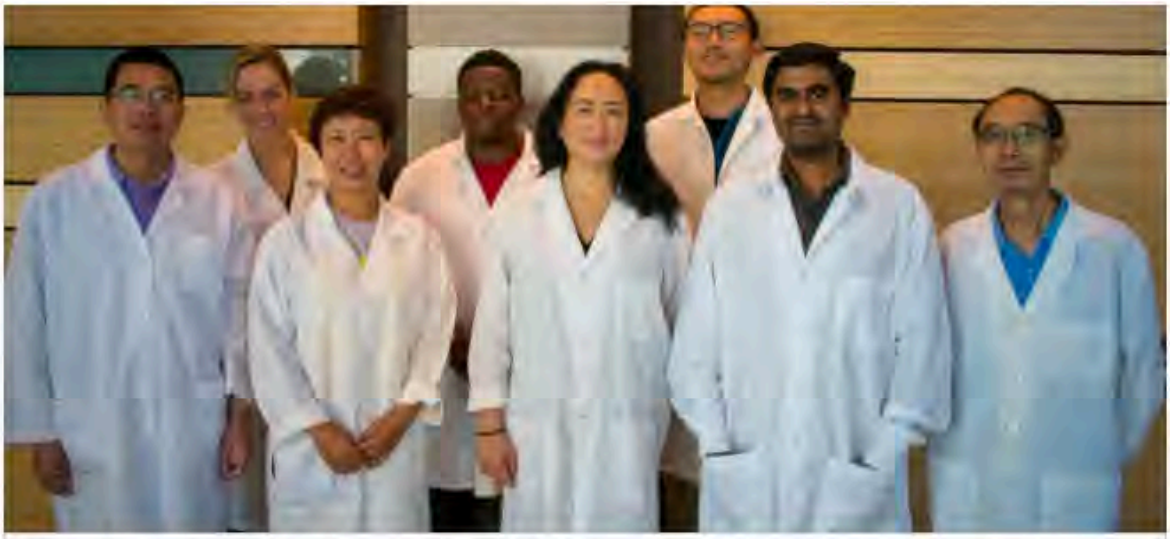
"There are currently drugs on the market to treat various conditions of the eye," said Dr. Jablonski. "However, a drug cannot effectively treat a disease if it can't reach its target tissue, which is often deep within the eye. This causes a problem because the eye has developed multiple barriers for keeping molecules, bacteria, and other foreign bodies out. We have developed a method for delivering drugs to the cells deep within the eye using topical delivery. We predict that our formulation can be coupled with many drugs and can be used to treat various diseases such as glaucoma, and age-related macular degeneration, to name a few."

Gabor Tigyi, PhD, associate vice chancellor for Research and Industry Relations, says he is encouraged by the research Dr. Jablonski will be doing while in the Innovator Lab Space, and looks forward to seeing her successfully move her idea to market and make a difference for people suffering with glaucoma.

"We recognize that our faculty are a powerhouse of ideas that often produce discoveries suitable for IP development," Dr. Tigyi said. "The review panel of the Innovation Lab application were very excited about the prospects of the application 'Novel Once Daily IOP Lowering Formulation' submitted by OculoTherapy, LLC. This new drug formulation the company is developing has a market potential that could reach in the hundreds of millions of dollars."

UTHSC's Liao Receives $2.6 Million Grant to Study Link Between Metabolic Syndromes and Dementia

Written by Sarah Ashley Fenderson | October 10, 2018



Dr. Liao (center), and her lab group received $2.6 Million to study the link between metabolic syndromes and dementia (Pictured from left to right: Xingyong Chen, MD, PhD; medical student Taiane Ferrari, Wei Zheng, MD, PhD; Tomi Akinduro, MD; graduate assistant Yi Zheng; graduate research assistant Mahesh Chandra Kodali; and Lubin Lan, MD, PhD) (Photo by Connor Bran/UTHSC)

According to the Alzheimer's Association, an estimated 5.7 million Americans of all ages are living with Alzheimer's dementia in 2018. While Alzheimer's disease accounts for 60 to 80 percent of cases, vascular dementia is the second most common dementia type. Francesca-Fang Liao, PhD, professor in the Department of Pharmacology at the University of Tennessee Health Science Center, has been awarded over $2.6 million to study the mechanisms by which metabolic syndromes, such as high blood pressure or excess body fat, could increase one's risk of dementia.

"There is increasing evidence that small vessel disease contributes, up to 40 percent, to cognitive impairment in the absence of clinical stroke and that subclinical small vessel disease drives cognitive changes, even when neuroimaging is normal," Dr. Liao said. "Therefore, there is a pressing need to better understand the underlying mechanisms and identify preclinical biomarkers, as well as prevention and treatment strategies."

Often incorrectly referred to as "senility" or "senile dementia," which reflects a belief that serious mental decline is a normal part of aging, dementia is not a specific disease. Rather, dementia is an overall term that describes a group of symptoms associated with a decline in memory or other thinking skills severe enough to reduce a person's ability to perform everyday activities. There is an increasing body of evidence that suggests inflammatory injury in the brain leads to neurological changes and could be linked to an increased risk of cognitive impairment or dementia. Dr. Liao's lab has shown that certain small molecular modulators, specifically miRNA-21, possibly play a regulatory role in the brain.

"We speculate that blood-born factors, especially metabolic inflammatory factors, can cause harmful metabolic conditions in the brain via small secretory vesicles named 'exosomes,' " Dr. Liao said. "Our lab hypothesizes that elevated miRNA-21 plays essential roles in the pathogenesis of aging and neurodegeneration. Therefore, eliminating miRNA-21 elevation will systemically prevent neurodegeneration."

Dr. Liao's lab also speculates that elevated circulating miR-21 contributes to neuroinflammation, neurological dysfunction, and neurodegeneration. Thus, these circulating processes may affect cell pathogenesis and the dissemination of inflammatory diseases, as well as serve as biomarkers and therapeutic-delivering cargos. "The long-term goal is to identify the molecular mechanisms underlying the increased risk for dementia patients with metabolic syndromes, and to develop new preventive and therapeutic strategies," Dr. Liao said.

Her project titled, "Novel mechanistic link between metabolic changes and dementia – potential role of miRNAs," is funded for five years.

UTHSC Hypertension Investigator Receives $2.6 Million Grant, Champions VCR CORNET Awards Program

Written by Sarah Ashley Fenderson | July 30, 2018

Dr. Kafait U. Malik (center) with his research team (from left to right: Ji Soo Shin, MS, research assistant; SaeRam Oh, MS, M2; Chi Young Song, PhD, research associate; and Purnima Singh, PhD, postdoctoral fellow). (Photo by Connor Bran/UTHSC).

The University of Tennessee Health Science Center researcher Kafait U. Malik, DSc, PhD, professor in the Department of Pharmacology, has been working in the area of cardiovascular science, with a focus on the mechanism underlying the development of high blood pressure, or hypertension, and its pathogenesis for more than four decades.

"I have a zest for science," Dr. Malik said. His recently funded grant renewal titled, "Angiotensins, Prostaglandins-Adrenergic Interactions," focuses on understanding the molecular mechanisms underlying sex differences in blood pressure.

According to research, men have higher blood pressure than women before menopause, which reverses after women enter menopause. Dr. Malik's team is working on the molecular mechanism underlying sex differences in the development of hypertension and its pathogenesis, and identifying novel targets for its treatment with agents selective for males

and females.

"Clinicians need distinct approaches when treating hypertension-related morbidity/mortality in females and males," Dr. Malik said. "Our proposal intends to elucidate the interaction between two enzymes, Cytochrome P450 1B1 and cytosolic phospholipase A2, as a major mechanism regulating sex differences in blood pressure, and identify the targets for the development of therapeutic agents selective for the treatment of hypertension in different sexes. Further, our goal is to determine whether the development of selective inhibitors for one of these specific enzymes would be useful for hypertension treatment in males but may be inadvisable in females, due to a decrease in the production of anti-hypertensive estrogen biomolecules."

Dr. Malik's hypertension research has been continually funded since the early 1970s. This year's renewal, which will put him close to the 50-year mark of continued project support, has been funded for $2,647,134 over a period of four years. However, when recent changes to the National Institutes of Health (NIH) policies caused a temporary gap in Dr. Malik's research funding, the senior researcher found himself experiencing an old, but familiar, challenge.

"For the first time as a senior investigator, I was unsure how I was going to continue my work, while I waited on funding decisions by NIH to be made," Dr. Malik said. "This can be a difficult challenge for more-advanced researchers."

The break unfortunately fell in between the Office of Research's bridge funding and Collaborative Research Network (CORNET) Award opportunities. Thankfully for Dr. Malik, UTHSC's Vice Chancellor for Research Steven R. Goodman, PhD, provided a Vice Chancellor for Research CORNET Award as a potential solution. "It was the opportunity I had been hoping for," Dr. Malik said.

Envisioned by Dr. Goodman, the Vice Chancellor for Research Collaborative Research Network (VCR CORNET) Awards represent an extension of the CORNET program originally launched in 2016. Following a similar submission style as a traditional CORNET competition, Dr. Malik was asked to submit a formal request to Dr. Goodman describing his project, with a budget.

Since its inception, CORNET projects have ranged in topics from cancer to substance abuse and the latest opportunity, health disparities. Dr. Goodman is thrilled at the news of Dr. Malik's continued NIH-funded research and recognizes the success of the CORNET Awards program for helping propel UTHSC investigators forward at any point in their careers.

"Hypertension is the leading cause of cardiovascular morbidity/mortality worldwide," Dr. Goodman said. "The research being done in Dr. Malik's lab is imperative to the development of novel therapies for the treatment of hypertension. I am pleased that the CORNET Awards program continues to help our researchers become successful, whether they are junior faculty working on new projects or senior faculty with a track record that indicates a high likelihood of continued success."