

The Multi-Omics Landscape of Cerebral Small Vessel Disease: From Genetic Architecture to Therapeutic Targets

Myriam Fornage, PhD



Fornage

Abstract: Cerebral small vessel disease (cSVD) is a major cause of stroke and dementia in older adults. Our research uses advanced brain imaging and multi-omics approaches to uncover the biological mechanisms underlying cSVD. Converging evidence from gene-mapping and functional studies implicates pathways governing endothelial autophagy and extracellular matrix integrity as central in the pathogenesis of cSVD.

Introduction

Cerebral small vessel disease (cSVD) represents a major source of morbidity and mortality in aging populations, manifesting as a leading cause of stroke, dementia, and cognitive decline. cSVD is an umbrella term for a range of conditions caused by damage to small blood vessels in the brain due to various causes, including arteriolosclerosis and cerebral amyloid angiopathy. Its most common radiological signature, white matter hyperintensities (WMH), is highly prevalent and substantially heritable, yet the fundamental biological mechanisms driving its pathogenesis remain poorly understood, leaving a critical void in mechanism-based treatments. Our research program conducts large-scale studies using genomics, proteomics, metabolomics, and epigenetics, aiming to construct a detailed molecular map of the disease. Such an integrated view is indispensable for identifying robust biomarkers, stratifying at-risk individuals for prevention trials, and prioritizing novel therapeutic targets for drug discovery and repositioning.

Visualizing Microvascular Injury: Neuroimaging Markers of cSVD

Neuroimaging plays a key role in cSVD research by providing the essential tools to visualize and quantify the spectrum of visible changes in the brain parenchyma associated with the disease. Magnetic resonance imaging (MRI) defines the key cSVD endophenotypes that serve as quantitative traits for our molecular studies. WMH, defined as areas of increased signal intensity on T2-weighted or fluid-attenuated inversion recovery (FLAIR) MRI sequences, represent the most common and widely studied imaging feature of cSVD. Although WMH volume is a robust marker, advanced imaging techniques offer more sensitive mea-

Continued on Page 3; Fornage

Team Science in Action: Advancing Stroke Prevention and Brain Health Through Collaboration

Ariana Victoria Aquino Hernández, MD & Anjail Z. Sharrief, MD, MPH



Hernández



Sharrief

Abstract: Advances in neuroscience and stroke prevention rarely occur in isolation. Instead, they emerge from collaborative research teams that integrate clinical expertise, community engagement, and multidisciplinary innovation. At UTHealth Houston, our programs demonstrate how team-based approaches can improve stroke prevention, recovery, and address health disparities. By supporting collaboration among clinicians, researchers, trainees, and community partners, neuroscience research can more effectively translate discoveries into meaningful improvements in brain health for all.

Behind the Science: Why Strong Research Teams Matter for Brain Health

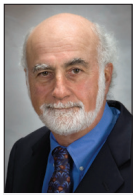
Scientific discovery is often imagined as the work of a single individual, but modern neuroscience tells a different story. The most meaningful advances emerge from collaborative teams that bring together diverse expertise and shared purpose. This is especially true in stroke prevention and recovery. Stroke remains a leading cause of disability and death worldwide, and its prevention requires understanding complex biological, behavioral, and social factors. Addressing these challenges demands scientific innovation and coordinated collaboration across disciplines. At UTHealth Houston, team-based research is central to improving stroke outcomes and reducing disparities in neurological care. The Stroke Transitions Education and Prevention (STEP) Program exemplifies this approach by integrating clinical care with research to better understand stroke recovery and develop strategies that improve long-term outcomes.

The Power of Team Science

Clinical research is inherently collaborative. Physicians identify clinical challenges, investigators design studies, and research coordinators operationalize protocols, manage participants, and ensure regulatory compliance. Within the STEP Program, this collaboration is highly structured. Clinicians across disciplines, clinical staff, research, administrative staff,

Continued on Page 4; Hernández/Sharrief

Director's Column



Byrne

From the Director, John H. Byrne, PhD

This academic year brought about some exciting new opportunities for expanded collaboration within our own institution at UTHealth Houston, and throughout the Texas Medical Center. In this column, I am delighted to highlight the continued growth that the Neuroscience Research Center has experienced this year.

This fall, the NRC once again coordinated the graduate course on the Neurobiology of Disease with a focus on Dementia Prevention and Research. The course lectures, which were open to all students and faculty, examined the complex biological, clinical, and societal dimensions of Alzheimer's disease and related dementias. Through a series of 14 lectures, students explored the cellular foundations of network abnormalities, covering topics such as functional genomics, autophagy, and proteasome dysfunction, along with the roles of the microbiome, inflammation, and glial cells in neurodegeneration. The course also considered the clinical perspective by exploring advanced neuroimaging techniques, emerging therapeutic interventions, and the impact of cerebrovascular health in vascular dementia. The curriculum concluded with a focus on caregiving and the behavioral and psychological symptoms associated with dementia. The NRC is grateful to our local leading experts in the field from UTHealth Houston; McGovern Medical School faculty included **Myriam Fornage, PhD, Keran Ma, PhD, Andrea Stavoe, PhD, Andrew Pickering, PhD, Paul Schulz, MD, Anjail Sharrief, MD, MPH, Long-Jun Wu, PhD, and Sean Savitz, MD**; as well as **Carolyn Pickering, PhD, RN** from the Cizik School of Nursing and **Neha Parikh, PhD** from the School of Dentistry. We were also delighted to include our Texas Medical Center neighbors, **Joseph Masdeu, MD, PhD** from the Houston Methodist Research Institute and **Joshua Shulman, MD, PhD** from the Baylor College of Medicine.

Based on the success of this course, we have chosen to highlight two articles by faculty members who lectured in the course. The first article is by **Myriam Fornage, PhD**, the Laurence and Johanna Favrot Distinguished Professor in Cardiology and Professor at the Institute of Molecular Medicine Center for Human Genetics at McGovern Medical School. Dr. Fornage uses advanced brain imaging and multi-omics approaches to uncover the biological mechanisms underlying cerebral small vessel disease (cSVD), a major cause of stroke and dementia in older adults. The second article is co-authored by **Ariana Victoria Aquino Hernández, MD**, Research Coordinator, and **Anjail Z. Sharrief, MD, MPH**, Professor, both from the Department of Neurology at McGovern Medical School. Their article emphasizes the value of collaborative research teams that combine clinical expertise, community involvement, and multidisciplinary innovation to enhance stroke prevention and recovery, while also tackling health disparities within communities.

Our 2025 Distinguished Lecture in the Neurosciences in October marked an especially memorable visit from Joshua A. Gordon, MD, PhD, a former Director of the National Institute of Mental Health and currently Chair of the Department of Psychiatry at Columbia Univer-

sity, Psychiatrist-in-Chief of the New York-Presbyterian/Columbia University Irving Medical Center, and Director of the New York State Psychiatric Institute. These special visits allow our community to learn from esteemed neuroscientists and provide an opportunity for NRC faculty to enjoy personal meetings with our guests. Dr. Gordon's work has had a profound impact on our understanding of the neural circuit basis of normal and disease-relevant cognitive function with a particular focus on understanding anxiety, depression and schizophrenia. His lecture, titled, "Circuits and Computation: A Neuroscientist's View of the Future of Psychiatry," was widely attended.

A particularly impactful project for the NRC this year involved our newly formed collaboration with our neighbor, Rice University, through their ENRICH (Educational and Research Initiatives for Collaborative Health) office. The "Rice and TMC Neuro Collaboration Award" was created to promote excellent collaborative and interdisciplinary neuro-related research programs among faculty members at Rice University with faculty of health-related institutions in the Texas Medical Center (TMC), with UTHealth Houston NRC being one of them. Forty proposals were received and reviewed for this innovative pilot program. The NRC is thrilled to support a grant proposal submitted by **Juliane Sempionatto, PhD**, assistant professor of electrical and computer engineering at Rice University, and **Aaron M. Gusdon, MD**, associate professor of neurosurgery at McGovern Medical School, UTHealth Houston, titled, "BLAST-DCI - Biosensor Lysophosphatidic acid Assay for Subarachnoid Hemorrhage Triage and Delayed Cerebral Ischemia Prediction." This project aims to develop a rapid bedside test that could help doctors identify high-risk patients within hours, tailor treatments sooner, and ultimately improve recovery after aneurysm-related brain hemorrhage.

The collaborative ecosystem within the TMC was even further on display as we hosted our record-breaking Neuroscience Poster Session on Saturday, December 2nd at the UTHealth Houston Cooley University Life Center. With 109 posters presented to over 50 judges, this was our largest poster session to date, building community and facilitating collaboration between UTHealth Houston, Baylor College of Medicine, and Rice University. We hope you enjoy some of the photos shared in the Newsletter and congratulate the undergraduate students, graduate students, and postdoctoral fellow winners. Additional poster presentation categories included faculty members, residents, and medical students. We're excited about the continued growth of this event and look forward to hopefully welcoming additional institutions later this year.

Also highlighted in this issue are special photos and moments from our annual reception at the meeting of the Society for Neuroscience in San Diego last November. We enjoyed catching up with several of our current and former UTHealth Houston community members on the last evening of the conference.

In the next issue of the Newsletter, we will share updates from our other important events from the school year, including our 2026 Distinguished Lecture in the Neurosciences and Brain Night for Kids at The Health Museum. Please check our website and subscribe to our monthly calendar to stay up to date on our current program offerings.

sures of white matter pathology. Peak-width of skeletonized mean diffusivity (PSMD), a metric derived from diffusion tensor imaging (DTI), has emerged as a particularly powerful biomarker of white matter microstructural integrity (Luckey et al., *Alzheimers Dement.* 20:8814, 2024). The full spectrum of cSVD also includes other MRI markers, such as lacunar infarcts (small, deep brain infarcts), cerebral microbleeds (small hemorrhages), and enlarged perivascular spaces (PVS), which reflect different facets of microvascular injury.

The Genetic Architecture of cSVD

Our early studies that demonstrated the high heritability of cSVD neuroimaging markers, especially WMH, have provided a powerful impetus for large-scale genetic discovery (Turner et al., *Arch. Neurol.* 66:847, 2009). By identifying genetic variants associated with these imaging endophenotypes, we have begun to delineate the fundamental molecular pathways implicated in disease etiology, providing critical insights into pathogenesis and highlighting potential targets for intervention.

Foundational Insights from Monogenic cSVD

Initial insights into the genetic landscape of cSVD arose from monogenic forms of the disease, where rare, highly penetrant mutations in genes encoding essential components of the vascular extracellular matrix (ECM) were found to cause severe, early-onset cSVD. Mounting evidence suggests a continuum between the genetic causes of monogenic cSVD and those of common multifactorial cSVD (Mishra et al., *Brain* 142:1009, 2019), with common variants in *COL4A1/COL4A2*, *HTRA1*, and *NOTCH3* associated MRI-defined cSVD as well as deep intracerebral hemorrhage and lacunar ischemic stroke.

Genome-Wide Association Studies (GWAS) of WMH

Over the past 10 years, we have conducted large, diverse genome-wide association study (GWAS) meta-analyses that have dramatically expanded our knowledge of the genetic landscape of WMH. These studies, encompassing tens of thousands of individuals, have so far identified 29 genetic loci (Table 1; Fornage et al., *Neurol. Genet.* 11:e200305, 2025; Sargurupremraj et al., *Nat. Commun.* 11:6285, 2020; Verhaaren et al., *Circ. Cardiovasc. Genet.* 8:398, 2015; Fornage et al., *Ann. Neurol.* 69:928, 2011).

Locus	Key Candidate Gene(s) & Implicated Function
chr17q25.1	TRIM47, TRIM65, MRPL38, ACOX1, FBF1. The strongest and most replicated locus, implicated in glial proliferation, autophagy, and oxidative damage.
chr2q33	NBEAL1, CARF, WDR12. Associated with coronary artery disease and regulation of brain-derived neurotrophic factor (BDNF).
chr10q24	SH3PXD2A. Implicated in Alzheimer's disease and glioma.
chr1q22	PMF1. Associated with intracerebral hemorrhage.
chr2p16	EFEMP1. Encodes a protein involved in the ECM and Notch signaling.

Table 1: Most robustly associated WMH loci identified by GWAS.

A core theme revealed from these GWAS findings is the central role of the vascular ECM in cSVD pathophysiology (Fig. 1).

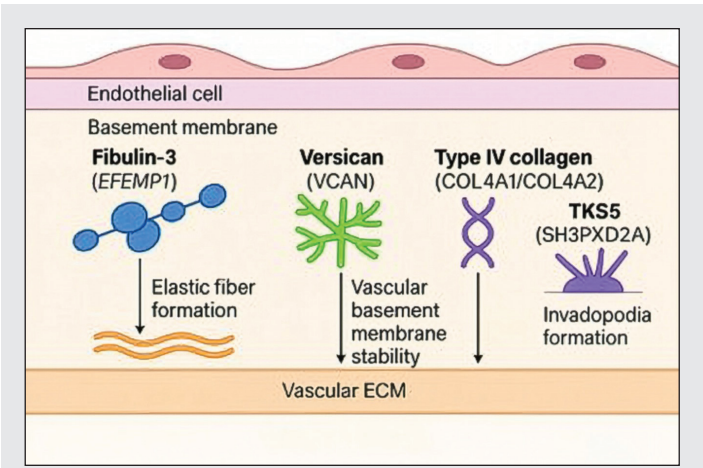


Figure 1: Genes implicated in GWAS of WMH have a critical role in the structural integrity of the small blood vessel walls and surrounding ECM.

Multi-Omics Integration: A Deeper Molecular Fingerprint of cSVD

Proteomics, metabolomics, and epigenetics capture the functional consequences of genetic risk and environmental exposures, offering powerful tools to identify biomarkers of active disease and elucidate the molecular cascades leading to brain injury.

Proteomic Signatures: Contrasting Cerebrospinal Fluid and Plasma

Large-scale proteomic studies have identified several proteins in cerebrospinal fluid (CSF) and blood plasma associated with WMH (Table 2; Gomez et al., *medRxiv* 2024; Debette et al., *Res. Sq.* 2024).

Notably, these proteomic signatures provide functional validation for the pathways identified through GWAS. For instance, the consistent identification of cathepsins and HTRA1, both involved in ECM processing, directly corroborates the genetic evidence implicating ECM integrity as central to cSVD pathogenesis.

Protein	Proposed Role in cSVD Pathophysiology	Fluid(s) Identified
Cathepsins (CTSB, CTSS)	Lysosomal proteases involved in ECM degradation and vessel wall permeability.	CSF, Plasma
Arylsulfatase B (ARSB)	Plays a role in ECM degradation and regulation of neurite outgrowth; highly expressed in microglia.	CSF, Plasma
HTRA1	Serine protease whose mutations are linked to monogenic cSVD; implicated in ECM processing.	Plasma
PILRA	A microglial immunoreceptor involved in immune response signaling.	CSF, Plasma
Oligodendrocyte-myelin glycoprotein (OMG)	Implicated in cell adhesion and neuronal regeneration; may serve as a general indicator of white matter health.	Plasma

Table 2: Proteins identified in proteomic analyses of WMH.

Metabolomic Correlates and Sex-Specific Associations

Our metabolomics analyses showed that the metabolic profiles associated with WMH are largely sex-specific, suggesting that distinct biological pathways may contribute to cSVD in men and women (Sliz et al., *Circulation* 2022. 145:1040, 2022). In males, higher WMH volume is strongly associated with higher circulating levels of hydroxyphenylpyruvate (HPP). As HPP accumulates under low-oxygen conditions, this finding suggests it may serve as a circulating biomarker for the chronic ischemic hypoxia thought to drive injury in the vulnerable watershed territories of the deep white matter. In females, the most significant metabolic association is with higher levels of glucuronate. This molecule is involved in detoxification processes within the blood brain barrier (BBB). This finding may reflect a compensatory protective mechanism in the BBB, or alternatively, a marker of its dysregulation under metabolic stress.

Epigenetic Studies and the Epigenetic Clock as a Marker of Accelerated Biological Aging

Our epigenome-wide association studies uncovered the role of DNA methylation in WMH and identified gene networks influencing WMH via integration of genetic and epigenetic markers. Specifically, using a comprehensive multi-analytic approach, 19 key regulatory genes linked to ECM organization and lipid metabolism were identified. Moreover, drug-repositioning analysis suggested antihyperlipidemic agents as potential therapeutic targets for WMH (Yang et al., *Brain* 146:492, 2023).

Another key application of epigenetic data is the estimation of biological age via algorithms known as epigenetic clocks. We found that accelerated epigenetic aging was significantly associated with a greater WMH burden, independent of chronological age and traditional vascular risk factors, suggesting that epigenetic clocks capture an effect of biological wear-and-tear on WMH not reflected by calendar years alone.

Conclusion and Future Directions

Advanced neuroimaging technologies and deep biological insights afforded by multi-omics studies have emerged as powerful tools for understanding cSVD etiology. This multi-layered view provides an unprecedented opportunity to develop targeted therapies and strategies to predict risk. Yet, critical questions and gaps remain. There is a pressing need for longitudinal studies to track how genetic risk translates into dynamic molecular changes and how these changes predict subsequent brain injury and clinical outcomes. cSVD genetic architecture and risk factor burden differ across populations. As exemplified by our Diverse VCID project (DeCarli et al., *Stroke* 56:758, 2025), there is an urgent need for inclusive research to ensure generalizability and equitable translation of findings. Our most recent work exploring the genetic basis of WMHs in Hispanic/Latino adults (Fornage et al., *Neurol. Genet.* 11:e200305, 2025) also underscores the value of genetic diversity in fine-mapping and novel gene discovery.

ABOUT THE AUTHOR:

Myriam Fornage, PhD is a professor at McGovern Medical School Institute of Molecular Medicine Research Center for Human Genetics and the Laurence and Johanna Favrot Distinguished Professor in Cardiology. She received her PhD from UTHealth Houston and pursued her postdoctoral training in the Department of Genetics at Case Western University. She joined the Institute of Molecular Medicine as a Research Fellow and was appointed Assistant Professor and then Associate Professor of Molecular Medicine. Dr. Fornage is also a faculty member of the Graduate School of Biomedical Sciences Program in Human and Molecular Genetics. Her research interests lie in the molecular genetics of complex diseases, with an emphasis on cerebrovascular disease and stroke. She is a member of the American Society of Human Genetics and the American Heart Association Stroke Council.

and research team members collaborate to provide evidence-based clinical care within a research environment. Research staff support engagement and retention in research across various stages of identification, recruitment, enrollment, follow-up, and retention. In certain cases, coordinators conduct home visits to reduce barriers for patients with limited mobility or transportation challenges, ensuring equitable access to research participation.

This coordinated effort has enabled the STEP Program to enroll more than 1,600 participants in clinical trials over the past decade. The program's strong infrastructure and commitment to patient engagement have made it a trusted partner for both NIH-funded and industry-sponsored studies focused on stroke prevention and recovery.

Addressing Stroke Disparities Through Research

Beyond scientific discovery, a central goal of the STEP Program is to address disparities in stroke care and outcomes. Stroke disproportionately affects Black and Hispanic populations, who face higher risks, worse outcomes, and greater likelihood of recurrence. Factors such as access to healthcare, transportation barriers, cultural differences, and health literacy all influence stroke outcomes. The STEP Clinic has treated over 10,000 stroke survivors and implemented innovative approaches to improve access to post-stroke care. Importantly, more than 50% of participants in STEP research studies are Black and Hispanic, populations that are often underrepresented in clinical research. The program is committed to ensuring that study research is representative of the communities we serve.

Supporting this mission, the team received \$2.9 million in funding from the National Institute of Neurological Disorders and Stroke to build infrastructure that enhances the enrollment of broad populations in neurological clinical trials. This initiative, the Community Brain Health Collaborative (CBHC) incorporates the voices of individuals with neurological disorders and community-based organizations into research design and execution. The CBHC extends beyond stroke to strengthening partnerships to improve access to care and engagement in research across neurological conditions.

A Team Built on Trust

A strong research team is not defined solely by its structure, but by the trust among its members. Successful teams create environments where individuals feel supported, valued, and empowered to contribute. In the STEP Program, coordinators are encouraged to take ownership of their work, propose solutions to barriers, and actively contribute to study design. As team members who interact most closely with participants, they provide valuable insights into patient needs and challenges. These contributions are recognized and supported through opportunities to present research, contribute to manuscripts, and advance professionally. Strong leadership and program management further ensure that studies remain organized, timelines are met, and team members have the resources needed to succeed.

Representation in scientific leadership also plays an important role in shaping strong research teams. Diverse perspectives influence both the questions being asked and the solutions being developed. Through mentorship and collaboration, we are helping foster a more inclusive and innovative environment for neurological research while supporting the development of future investigators. This culture of trust and collaboration directly enhances research quality, from accurate data collection to sustained participant engagement.

Conducting Multidisciplinary Studies: The VIRTUAL Trial

One of the clearest examples of team science in action is the VIRTUAL trial (Video-Based Intervention to Reduce Hypertension Treatment and Outcome Disparities in Adults Living with Stroke or Transient



Figure 1. Members of the stroke prevention research team at UTHealth Houston, led by Dr. Anjail Z. Sharrief, collaborating on clinical trials focused on improving stroke outcomes and reducing health disparities.

Ischemic Attack), an NIH-funded study led by Dr. Sharrief. Designed as a randomized comparative effectiveness trial, VIRTUAL evaluates whether a social risk-informed telehealth model can improve blood pressure control and reduce disparities in stroke outcomes. The trial enrolled more than 500 stroke and TIA survivors, with recruitment conducted from March 2022 through April 2025, followed by ongoing longitudinal follow-up.

What makes VIRTUAL especially notable is the breadth of collaboration required to conduct it. The intervention integrates remote blood pressure monitoring, structured telehealth visits, and coordinated care from clinicians, pharmacists, and social workers, with follow-up occurring at multiple time points after hospital discharge. The study was built through collaboration across multiple disciplines and UTHealth institutions. This interdisciplinary structure allowed the study to simultaneously address clinical management and social factors that influence stroke outcomes. At the operational level, a trial of this scale required extensive coordination among multiple principal investigators, experienced project management, senior research coordinators, and clinical teams, including hospital nurses, attending physicians, and fellows. Together, these teams supported patient recruitment, discharge transitions, telehealth follow-up, and high-quality data collection.

The VIRTUAL trial reflects a shift toward more accessible, patient-centered care models. By leveraging telehealth, the study addresses barriers such as transportation, time constraints, and limited access to specialty care. More broadly, it demonstrates how large-scale clinical trials depend on deeply integrated collaboration across clinical, operational, and academic teams.

Looking Forward

The future of neuroscience will continue to depend on strong, collabora-

tive research teams capable of addressing complex health challenges. As stroke prevention strategies evolve, team science will remain essential for translating research into meaningful improvements in patient care. For the STEP Program, this work represents more than research—it reflects a commitment to improving the lives of stroke survivors and addressing persistent gaps in care. By combining clinical expertise, community engagement, and multidisciplinary collaboration, the program demonstrates how research can drive meaningful change in brain health outcomes. Ultimately, progress in neuroscience is not the result of individual effort alone, but of teams united by a shared mission to improve the health of the communities they serve.

ABOUT THE AUTHORS:

Ariana Victoria Aquino Hernández, MD is an international medical graduate from the Benemérita Universidad Autónoma de Puebla in Mexico. She serves as an IRB and compliance manager, supporting the ethical oversight and regulatory management of clinical research involving human participants, and as a senior research coordinator in the STEP Program.

Anjail Z. Sharrief, MD, MPH is a tenured professor of Neurology at McGovern Medical School. She serves as Director of the Stroke Transitions Education and Prevention (STEP) Clinical and Research Program and leads several large clinical trials focused on stroke prevention and recovery. Her research, including the NIH-funded VIRTUAL study, examines innovative models of care to improve post-stroke outcomes and reduce health disparities. Dr. Sharrief's leadership reflects the growing role of women in advancing neuroscience research. As a physician-scientist and principal investigator, she leads large-scale studies while mentoring the next generation of researchers and advancing collaborative research efforts aimed at improving brain health.

grants & awards

Faculty from the Advanced Imaging Research (AIR) lab in Neuroradiology were recognized by the Radiological Society of North America (RSNA) and received the Cum Laude Award for the educational exhibit, "Traumatic injuries of the craniocervical junction in adults: What CT misses, MRI reveals." This award honors excellence in educational quality and scientific merit at the RSNA Annual Meeting. Recipients include: **Eliana Bonfante-Mejia, MD**, professor, **Jennifer McCarty, MD** (MD Anderson Cancer Center), **Roy Riascos, MD**, professor of radiology and neurosurgery, vice chair for innovations, and chief of neuroradiology, **David Timaran Montenegro, MD**, assistant professor, as well as fellows, Santiago Aristizábal-Ortiz, MD and Mario Mahecha, MD.

Three NRC faculty from the Department of Psychiatry and Behavioral Sciences, **Elliot Hong, MD**, the Stephen Brannan, MD, Distinguished Professor in Clinical Methodology and director of the Houston Psychosis Research Center, **Joy M. Schmitz, PhD**, professor and director of the Center for Neurobehavioral Research on Addiction, and **Heather Webber, PhD**, assistant professor at the Center for Neurobehavioral Research on Addiction, received support from the National Institutes of Health (NIH) National Institute on Drug Abuse (NIDA) for a grant titled, "Contingency management plus deep transcranial magnetic stimulation for the treatment of cocaine use disorder." This randomized controlled trial will examine the effects of a combined treatment that uses deep transcranial magnetic stimulation and contingency management for treatment of individuals with refractory cocaine use disorder.

Gustavo Ayala, MD, professor and distinguished chair in pathology and laboratory medicine, was honored by the journal *Science* as the runner up for its Scientific Breakthroughs of 2025. The article is titled, "Nerve-to-cancer transfer of mitochondria during cancer metastasis," and was published in *Nature*.

Zhiqiang An, PhD, professor at the Institute of Molecular Medicine (IMM), vice president of drug discovery at UTHealth Houston, director of the Texas Therapeutics Institute and the Robert A. Welch Distinguished University Chair in Chemistry, and **Wei Cao, PhD**, professor of anesthesiology, critical care and pain medicine, received funding from the Texas Alzheimer's Research and Care Consortium (TARCC) for their study, "Functional elucidation and precision targeting of axl in Alzheimer's disease."

Gabriel R. Fries, PhD, assistant professor of psychiatry and behavioral sciences, recently received the Baszucki Group Metabolic Psychiatry Scholar Award for a project titled, "Deciphering the complex link between diet, metabolic dysfunction, and suicide risk." The overall goal of this proposal is to characterize the association between metabolic function and diet parameters with suicide risk in the general population and hospitalized patients with mood disorders. In addition, the American Foundation for Suicide Prevention (AFSP) is supporting the project, "Brain-relevant blood biomarkers for suicidal behavior in bipolar disorder." Dr. Fries, the site PI, is working with PIs: Marie Gaine, PhD (University of Iowa, College of Pharmacy) and Sarven Sabuncyan, PhD (Johns Hopkins University, School of Medicine). The overall goal of this proposal is to identify suicide-related mRNA and DNA changes in the blood that reflect changes in the brain, testing the hypothesis that extracellular vesicles and cell-free DNA detectable in peripheral blood reflect real-time changes in the suicidal brain.

Xin (Alex) Ge, PhD, professor at the IMM and Kay and Ben Fortson Distinguished Chair in Neurodegenerative Disease Research, received support from the Cancer Prevention and Research Institute of Texas (CPRIT) for a new project which aims to develop efficient blood-brain-barrier penetration of antibody-drug conjugates for improved treatment of brain metastases of cancer cells.

Charles Green, PhD, professor at the School of Behavioral Health Sciences and the Institute for Clinical Research and Learning Health Care, is co-principal investigator of a new trial. UTHealth Houston, in collaboration with The University of Texas Medical Branch at Galveston (UTMB Health) and several other Texas institutions, has been awarded \$50 million from

the Texas Health and Human Services Commission to lead a collaborative two-year, multicenter research trial to evaluate "Ibogaine medicine for PTSD, addiction, and cognitive trauma (IMPACT)."

Aaron M. Gusdon, MD, assistant professor of neurosurgery, along with Julianne Sempionatto, PhD (Rice University), received funding from the Rice University ENRICH Collaboration Seed Grant Program for their project titled, "BLAST-DCI - biosensor lysophosphatidic acid assay for subarachnoid hemorrhage triage and delayed cerebral ischemia prediction." This project aims to create a point of care blood test that can identify patients at high risk for delayed brain injury following aneurysmal subarachnoid hemorrhage, allowing for earlier intervention to improve outcomes.

Georgene Hergenroeder, PhD, associate professor of neurosurgery, received the Pramod Dash, PhD Brain Injury Research Endowment from the Mission Connect/TIRR Foundation. It was awarded to Dr. Hergenroeder for her research focused on restoring function in individuals with traumatic brain injury.

Melba Hernandez-Tejada, PhD, DHA, associate professor of psychiatry and behavioral sciences, received a four-year clinical trial award from the U.S. Department of Defense Traumatic Brain Injury and Psychological Health Research Program. The study will examine the effectiveness of an intensive two-week combined intervention of transcranial direct-current stimulation and massed prolonged exposure therapy delivered via home-based telemedicine for the treatment of post-traumatic stress disorder and pain.

Peggy Hsieh, PhD, professor and assistant dean for educator development, and **Gioconda Mojica, MD**, assistant professor of ophthalmology and visual science, received a President's Grant from the Josiah Macy Foundation to fund an elective course titled, "Fostering connection and shame resilience in health professions education through self-compassion."

Jennifer Kawi, PhD, MSN, the Lee and Joseph Jamail Distinguished Professor at the School of Nursing, received a four-year grant to study, "Personalized auricular point acupressure for chronic pain self-management in rural populations," from the National Center for Complementary and Integrative Health and the NIH National Institute of Neurological Disorders and Stroke (NINDS). The award is part of the NIH's Helping to End Addiction Long-term (HEAL) Initiative. Co-principal investigators are **Hulin Wu, PhD**, the Betty Wheelless Trotter Professor, Dr. D.R. Seth Family Professor in Biostatistics, and chair of the Department of Biostatistics and Data Science at the School of Public Health, and Jane Bolin, PhD, JD, RN (University of North Texas Health Science Center College of Nursing).

Samden Lhatoo, MD, the John P. and Kathrine G. McGovern Distinguished University Professor of Neurology, executive vice chair of neurology, director of the Texas Comprehensive Epilepsy Program (TCEP) and co-director of the Texas Institute of Restorative Neurotechnologies (TIRN), received a NIH Resource-Related Research Projects (R24) grant from the NIH-NINDS for a 4-year project, "International seizure and sudden unexpected death in epilepsy (SUDEP) research repository (InSSURR)."

Hemanth Mohan, PhD, assistant professor of neurobiology and anatomy, received the National Alliance for Research on Schizophrenia and Depression (NARSAD) Young Investigator Grant from the Brain & Behavior Research Foundation (BBRF). This grant supports early-career scientists conducting innovative neuroscience research relevant to the understanding, prevention, and treatment of psychiatric and brain disorders.

Rodrigo F. Morales, PhD, professor of neurology, was awarded a grant from the Greater Houston Alzheimer's Disease Research Collaboration titled, "Linking amyloid-beta strain heterogeneity to mitochondrial vulnerability in Alzheimer's disease." This exploratory project will evaluate whether mitochondrial damage is differentially activated by different amyloid-beta conformers (strains) in the brains of Alzheimer's disease patients. In addition, he has received support from the U.S. Department of Agriculture's (USDA) Agricultural Research Service (ARS) for a grant titled, "Evaluation of CWD (chronic wasting disease) prion uptake by plants." This exploratory project will evaluate the ability of six specific plant species to uptake prions

from contaminated soils.

Roy Riascos, MD and **Andres Rodriguez Gonzalez, MD**, assistant professor of diagnostic and interventional imaging, were honored by the American Society of Neuroradiology (ASNR) with the Magna Cum Laude Award for the educational exhibit, “Traumatic and non-traumatic spine emergencies in geriatric patients,” honoring outstanding educational quality and scientific merit at the ASNR Annual Meeting.

Claudio Soto, PhD, professor of neurology and director of The George and Cynthia W Mitchell Center for Alzheimer’s Disease and Other Brain Related Illnesses, received a 2-year grant from the Michael J. Fox Foundation for a project titled, “Implementation and validation of a non-invasive alpha-synuclein (αSyn)-SAA test in biological fluids.” The main goal of this project is to adapt the technology for detection of αSyn aggregates in non-invasively collected biological fluids, verify its robustness and validate its sensitivity and specificity in groups of patients and controls. Dr. Soto was also awarded funding from the Texas Alzheimer’s Research Consortium to study the, “Role of alpha-synuclein pathology in Alzheimer’s disease.” The major goal of the project is to advance the understanding of the contribution of αSyn in AD by developing and validating a biomarker test to detect the presence of αSyn aggregates in biological fluids of patients affected by AD, as well as to investigate the influence of αSyn co-pathology in the progression and severity of AD, both clinically and neuropathologically.

J. Michael Wilkerson, PhD, associate professor at the School of Public Health, was one of 3 UTHealth Houston faculty members recognized for their teaching excellence and commitment to enhancing health science education with an induction into the 2026 class of The University of Texas Kenneth I. Shine, MD, Academy of Health Science Education.

Peter H. Yang, MD, assistant professor of pediatric neurosurgery, received a research grant from the Pediatric Hydrocephalus Foundation to study, “Choroid plexus macrophage organoid co-culture model for neonatal posthemorrhagic hydrocephalus.”

Licong Cui, PhD, associate professor at McWilliams School of Biomedical Informatics, **Hongfang Liu, PhD**, vice president of Learning Health System at UTHealth Houston, the D. Bradley McWilliams Chair, director for the Center for Translational AI Excellence and Applications in Medicine, and **GQ Zhang, PhD**, vice president and chief data scientist at UTHealth Houston, co-director of the TIRN, professor of neurology, and distinguished chair in Digital Innovation, are principal investigators of the new national initiative, “Using real-world data to derive common data elements for Alzheimer’s disease and AD-related dementias research through ontological innovation” (ReCARDO). This work, supported by the NIH National Institute on Aging (NIA), consists of a collaboration of 10 institutions, and will use real-world data to help researchers understand how treatments and health trends are related to Alzheimer’s disease and related dementias. Three additional principal investigators include Ronald Petersen, MD, PhD (Mayo Clinic), Zoe Arvanitakis, MD (Rush University), and Yong Chen, PhD (University of Pennsylvania).

ReCARDO co-investigators from UTHealth Houston include: **Rashmie Abeysinghe, PhD**; **Cici Bauer, PhD**; **Amy Franklin, PhD**; **Sunyang Fu, PhD**; **Yan Huang, PhD**; **Xiaoqian Jiang, PhD**; **Yejin Kim, PhD**; **Youngran Kim, PhD, MPH**; **Trudy Krause, DrPH**; **Dennis Lal, PhD**; **Xiaojin Li, PhD**; **Carolyn Pickering, PhD, RN**; **Paul Schulz, MD**; **Toufeeq Ahmed Syed, PhD**; **Shiqiang Tao, PhD**; **Jinlian Wang, PhD**; **Qian Xiao, PhD, MPH**; **Mustafa Yildiz, PhD**; and **De-gui Zhi, PhD**.

GQ Zhang, PhD received funding from the National Science Foundation for a grant titled, “SCH: LogiTech: Logic-based temporal phenotyping for cohort discovery in epilepsy.”

Graduate & Medical Students, Postdoctoral Fellows & Residents

Paula Bender, PhD student in the lab of **Kristin Eckel-Mahan, PhD**, associate professor at the IMM Center for Metabolic and Degenerative Diseases (CMDD), received several awards including the Dr. John J. Kopchick Fellowship, the Dr. John J. Kopchick Research Award, and the Dee S. and Patricia Osborne Endowed Scholarship in the Neurosciences.

Ankush Chandra, MD, PGY-6, chief resident in the Vivian L. Smith Department of Neurosurgery, received the Best Abstract in Medical Education and Training award from the Congress of Neurological Surgeons for his work, “Dedicated research structure during neurosurgery residency: Impact on academic productivity and long-term success.” This work was conducted under mentorship of Manish Aghi, MD, PhD (University of California San Francisco Medical Center).

Shivi Garg, graduate student in the lab of **Louise McCullough, MD, PhD**, professor, chair, and Roy M. and Phyllis Gough Huffington Distinguished Chair of neurology, and co-director of UTHealth Neurosciences, received the Dee S. and Patricia Osborne Endowed Scholarship in the Neurosciences.

Dounya Jalloul, graduate student in the lab of **Michael Beierlein, PhD**, professor of neurobiology and anatomy, received the Dr. John J. Kopchick Fellowship renewal, in addition to the Gordon Research Conferences (GRC) Carl Storm Fellowship and Poster Award at the GRC on Thalamocortical Interactions in Italy.

Kesha Pugalenth, graduate student in Rice University’s Department of Electrical Computer Engineering, was awarded a National Library of Medicine (NLM) Research Training Fellowship in Biomedical Informatics and Data Science for 2026 through the Gulf Coast Consortium. NRC Faculty member, **Tatiana T. Schnur, PhD**, professor of physical medicine and rehabilitation, is the primary PhD advisor.

Mya Rodriguez, MS, a PhD candidate in the lab of **Andrea Stavoe, PhD**, assistant professor of neurobiology and anatomy, received the 2025 Terry J. Crow, PhD, Scholarship in Neuroscience. Her doctoral research uses a combination of live, preclinical model microscopy and primary mammalian neurons to investigate how neuronal identity regulates the autophagy pathway during aging. In addition, she received the Charlene Kopchick Fellowship and the Dee S. and Patricia Osborne Endowed Scholarship in the Neurosciences.

Jordy Sepulveda, PhD, postdoctoral fellow in the lab of **Long-Jun Wu, PhD**, professor and director of the IMM-CNGB and C. Harold and Lorine G. Wallace Distinguished University Chair, received a NIH-NINDS Koo award for a project titled, “The effects of APOE genotype in homeostatic microglial function in preclinical APOE mouse model.”

Julia Zickus, graduate student in the lab of **Pratip Bhattacharya, PhD** (MD Anderson Cancer Center), received the Sam Taub and Beatrice Burton Endowed Fellowship in Vision Disease, as well as the Dee S. and Patricia Osborne Endowed Scholarship in the Neurosciences.

Every year, the NRC recognizes medical and graduate students with two special awards. The “Graduate Student Brain Awareness Outreach Award” is awarded to graduate students who exhibit remarkable dedication to brain awareness activities in their community. This year, the award was given for a second time to **Madison Shyer**, a student in the lab of **Paul E. Schulz, MD**, professor of neurology. Madison has participated annually in the Summer Biomedical Academy as well as The McGovern Health Museum Summer Internship program. Her partnership with The Health Museum continues to grow as a volunteer in the DeBaKey Cell Lab, invitations to participate in the new monthly “Ask-A-Scientist” series, and by serving as a medical expert in the “Dissections with a Doc” program.

The “Outstanding Fourth-Year Medical Student in the Neurosciences Award” honors medical students for excellence in neuroscience research while in medical school. This year, the award was presented to **Nathan D. Bliss** for his research studying epilepsy and neurodevelopmental disorders. Nathan performed his research under mentorship of **Jay Gavvala, MD**, associate professor of neurology, and plans to pursue pediatric neurology.

In the Spotlight

Society of Neuroscience Reception



In November, the NRC hosted a reception at the Society for Neuroscience's annual meeting in San Diego, CA, held at the Horton Grand Hotel.



In the Spotlight

Distinguished Lecture in the Neurosciences

October 21, 2025

The NRC hosted our 2025 Distinguished Lecture in the Neurosciences this fall at McGovern Medical School. Our distinguished guest was **Joshua A. Gordon, MD, PhD**, former Director of the National Institute of Mental Health and current Chair of the Department of Psychiatry at Columbia University, Psychiatrist-in-Chief of the New York-Presbyterian/Columbia University Irving Medical Center, and Director of the New York State Psychiatric Institute. Dr. Gordon is pictured here with NRC Director and professor of neurobiology and anatomy, **Jack Byrne, PhD**, and **Jair C. Soares, MD, PhD**, vice president of behavioral sciences and dean of the UTHealth Houston School of Behavioral Health Sciences. Dr. Gordon's lecture was titled, "Circuits and Computation: A Neuroscientist's View of the Future of Psychiatry."



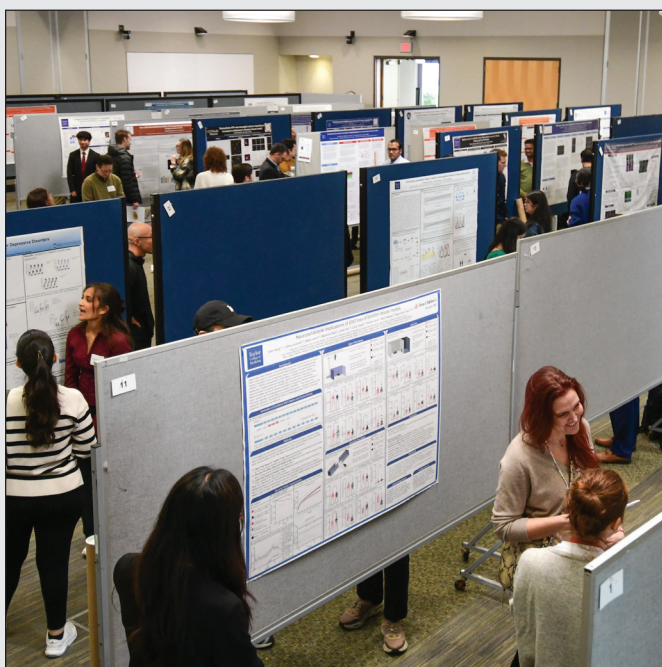
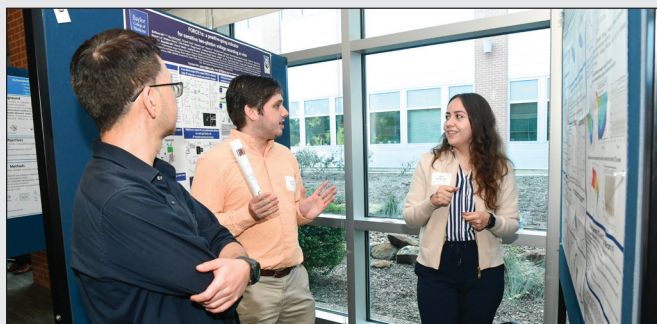
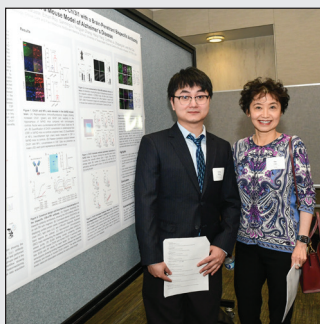
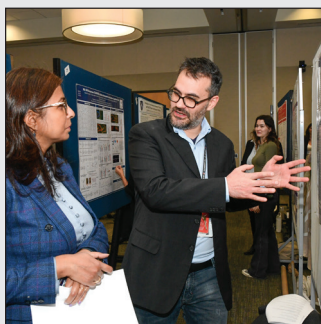
31st Annual Neuroscience Poster Session

Saturday, December 6, 2025
UTHealth Cooley University Life Center

The NRC hosted our 31st Annual Neuroscience Poster Session which included faculty, residents, postdoctoral fellows, graduate and medical students, as well as undergraduate students, from three Texas Medical Center institutions. The large group included the Departments of BioSciences, Psychological Sciences, and Electrical and Computer Engineering at Rice University, the Department of Neuroscience at Baylor College of Medicine, and the UTHealth Houston Neuroscience Research Center. A record breaking 109 research posters were presented to faculty judges from each institution and prizes were awarded for the best poster presentations in each category. Congratulations to all of the winners from the 31st Annual Neuroscience Poster Session.

In the Spotlight

CONTINUED FROM PAGE 11; POSTER SESSIONS



Presenters represented three different TMC institutions.



Faculty judges from Baylor College of Medicine, Rice University, and UTHealth Houston.



Presenters who received 1st, 2nd, or 3rd place prizes in their categories.

news & information

Congratulations to **Jaroslav Aronowski, MD, PhD**, professor and Roy M. and Phyllis Gough Huffington Chair in Neurology, on 40 years of service at UTHealth Houston.

NRC faculty members **Tatiana Barichello, PhD**, associate professor of psychiatry and behavioral sciences, and **Rodrigo Hasbun, MD, MPH**, professor of infectious diseases, along with Felipe Dal-Pizzol, MD, PhD, served as co-editors for the book, *Neurobiology of Infectious Diseases* (Volume 1), published by Academic Press (Elsevier). This book covers the mechanisms of central nervous system infections and focuses on bacterial, viral, fungal, and parasitic infections, addressing the microbiota-gut-brain axis and neuroimmune interactions. **Dr. Barichello** also served as editor for the book, *Blood-Brain Barrier*, part of the series *Neuromethods* (Volume 221) and published by Springer Nature.

UTHealth Houston recently established the new Novel Treatments for Acute Brain Injury Institute, which will be led by **H. Alex Choi, MD**, professor of neurosurgery, who will serve as the executive director. Building upon the UTHealth Houston Neurosciences Neurocritical Care Program, which is directed by Dr. Choi, the institute will specialize in innovative care for patients with acute brain injuries through research, clinical expertise, education, and community outreach. The institute is another important collaboration between UTHealth Houston and Memorial Hermann Health System. Other leaders include neurosurgery faculty members: **Ritvij Bowry, MD**, associate professor; **Robert Brown, MD**, associate professor; **Jung Hwan Kim, PhD**, associate professor; **Sophie Ren, MD, PhD**, associate professor; **Luis Torres, MD**, assistant professor and director of the neurocritical care fellowship; and **Sarah Wall, MSN, MBA**, director of Advanced Practice and Nursing Services.

Congratulations to **Erin Furr-Stimming, MD**, professor in the Department of Neurology and Memorial Hermann Endowed Chair, who has been named assistant dean for Admissions and Student Affairs.

Georgene Hergenroeder, PhD, associate professor of neurosurgery,

presented, "Early biomarkers prognostic for chronic neuropathic pain after spinal cord injury," at the 9th International Congress on Neuropathic Pain in Berlin, Germany.

In March, **Samden Lhatoo, MD**, professor of neurology and director of the Texas Comprehensive Epilepsy Program, served as conference organizer for the 4th international conference on Artificial Intelligence in Epilepsy and Neurological Disorders. The program, held in Puerto Rico, featured high-impact discussions spanning state-of-the-art research and real-world deployment of AI in clinical care, with a focus on rigor, relevance, and translational potential.

The 2nd Annual UTHealth Houston Movement Disorders Symposium was held in March and was presented by UT MOVE- UTHealth Movement Disorders Division. **Swati Pradeep, DO**, assistant professor of neurology, served as the course director, and **Mya Schiess, MD**, professor and Adriana Blood Distinguished Chair in Neurology, served as the UT MOVE Division chair.

In February, the Louis A. Faillace, MD, Department of Psychiatry and Behavioral Sciences held their second annual Child & Adolescent Mental Health Update Conference. The topic was Comprehensive Autism Care Across the Spectrum: Assessment, Management, and Transition for Youth and involved a collaborative effort between **Jair Soares, MD, PhD**, professor and chair, and co-course directors, **Cesar Soutullo, MD, PhD**, and collaborators from Texas Children's Hospital and Baylor College of Medicine. NRC Faculty speakers included: **Taiwo Babatope, MD, MPH, MBA**, assistant professor and training director of the Child and Adolescent Fellowship Program; **Sarah Lund-Wilson, MD**, assistant professor of pediatrics and director of the Neurodevelopmental Program; **Gabriel Anzueto, MD**, assistant professor of pediatrics and medical director of the Dan L. Duncan Children's Neurodevelopmental Clinic; in addition to Antonio Pagan, PhD, a postdoctoral fellow in psychiatry and behavioral sciences.

NRC Executive Committee



The NRC mourns the passing of our Executive Committee member, **Michael A. Jacobs, PhD**, professor and vice chair for research in the Department of Diagnostic and Interventional Imag-

ing. Dr. Jacobs was a valued member of the UTHealth Houston community. His clinical interests included developing radiological methods for the detection, monitoring, and treatment of many diseases. He was a visionary, whose scientific impact and his commitment to fostering community, will be felt for years to come.



The NRC would like to extend our gratitude to **Susan Tortolero Emery, PhD**, as she rolls off the NRC Executive Committee. She currently serves as the senior associate dean of academic

and research affairs, as well as professor of epidemiology and of health promotion and behavioral sciences at the UTHealth Houston School of Public Health. The NRC has appreciated her service on this Committee for the past several years.



We would also like to welcome **Aanand Naik, MD**, professor and chair of management, policy and community health at the School of Public Health, to the NRC Executive Committee. Dr.

Naik also serves as associate dean for learning and health systems, as well as the director of the Institute on Aging. He is a Geriatrician and Health Outcomes Researcher with a research program focused on defining patient-centeredness and characterizing it as a dimension of health care quality and integral to learning health systems. We are thrilled to have his participation in this leadership role.

 UTHealth Houston
Neuroscience Research Center

6431 Fannin St., MSB 7.046
Houston, TX 77030

NONPROFIT ORG.
U. S. POSTAGE
PAID
HOUSTON, TX
PERMIT NO. 209

ADDRESS SERVICE REQUESTED

Keep in Touch!

Website: www.uth.edu/neuroscience-research-center/

Questions? Comments?

Contact us at 713-500-5538
or E-mail: UTHealth.NRC@uth.tmc.edu

This Newsletter is distributed to individuals and groups engaged in neuroscience research within the TMC and worldwide and features research, neuroscience accomplishments and outreach efforts performed at UTHealth Houston. Past issues are available on the NRC website.

The Neuroscience Research Center Newsletter

Editor: Anne Hart, PhD

Design: Chad Inmon, ImageSet

The Neuroscience Research Center is a component of
The University of Texas Health Science Center at Houston

Director: John H. Byrne, PhD

Editor: Anne Hart, PhD

Executive Committee:

Jennifer E. S. Beauchamp, PhD, RN

John H. Byrne, PhD

Dana M. DeMaster, PhD

Amy Franklin, PhD

Louise McCullough, MD, PhD

Kevin A. Morano, PhD

Aanand Naik, MD

Neha Parikh, PhD

Joy Schmitz, PhD

Jair C. Soares, MD, PhD

Nitin Tandon, MD

The University of Texas

Health Science Center at Houston

President: Melina Kibbe, MD