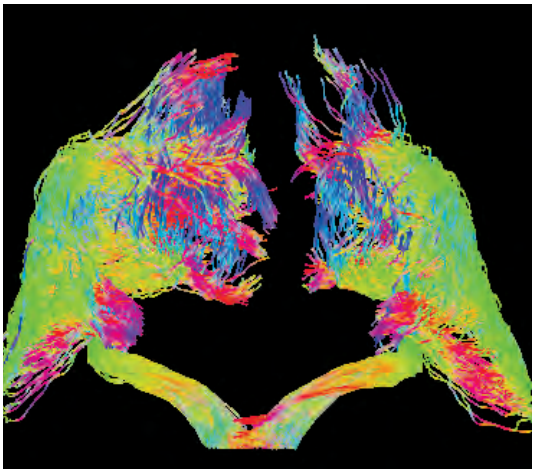
Icahn School of Medicine at Mount Sinai

The Friedman Brain Institute

Research Centers and Programs Aim for Bold Discoveries



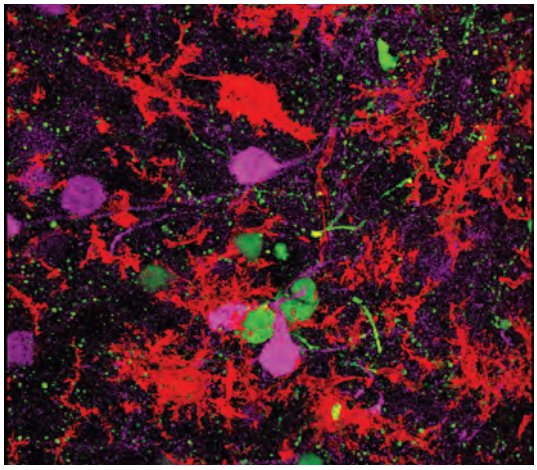
3-dimensional rendering of probabilistic tractography of the optic tracts and radiations from diffusion MRI data obtained from human subjects at 7 Tesla.

Credit: Jack Rutland, Icahn School of Medicine at Mount Sinai student, Balchandani Laboratory

Advanced Neuroimaging Research Program

The Advanced Neuroimaging Research Program (ANRP) within the Translational and Molecular Imaging Institute leverages the technical and clinical strengths of the Icahn School of Medicine at Mount Sinai to facilitate innovative brain imaging research. It was recently established to accelerate the development of advanced imaging technologies aimed at improving diagnosis, treatment, and surgical planning for neurological and psychiatric diseases.

As the Director of the Program, **Priti Balchandani, PhD,** who joined Mount Sinai from Stanford University in 2012, envisions a growing number of ANRP-affiliated laboratories spanning multiple Icahn School of Medicine departments, including Neuroscience, Neurology, Neurosurgery, Psychiatry, Radiology, and Genetics and Genomic Sciences. The Program guides the development of new acquisition methods, hardware, and analysis tools to provide advanced multimodal imaging of the living brain—including ultrahigh-field MRI, which allows for the visualization of the central nervous system in unprecedented detail. Among the Program's goals is to maintain the growth of faculty at Mount Sinai who utilize brain imaging as a core experimental approach in humans and animals, establish a set of research projects that will position the Icahn School of Medicine as one of the nation's leading neuroimaging centers, and provide support to execute pilot and funded studies, as well as to help design new studies that could benefit from the suite of advanced brain imaging methods available at Mount Sinai.
tmii.mssm.edu/research/programs/neuroimaging



Excitatory neurons of the mouse prefrontal cortex stained by immunohistochemistry for CaMKII (red), phospho-ERK (purple) and GFP (green).

Credit: Caroline Menard, PhD, Postdoctoral Fellow, Russo Laboratory

Center for Affective Neuroscience

The Center for Affective Neuroscience, directed by **Scott Russo, PhD,** a Mount Sinai faculty member since 2008, supports a multidisciplinary group of researchers whose focus is to uncover fundamental biological processes that govern behavior to better understand the molecular and circuit basis of a number of affective illnesses, such as depression, anxiety, and post-traumatic stress disorder. The diverse group of renowned scientists and physicians who are a vital part of the Center have been able to uncover fundamental biological processes governing affective behaviors by incorporating critical rodent and nonhuman primate translational models into studies of human subjects to gain a highly sophisticated understanding of disease mechanisms.

The Center is organized into four key focus areas—affective processing and decision-making, threat evaluation, reward processing and motivation, and social cognition—each structured to bridge the preclinical and clinical work of the researchers, a truly translational approach. Significantly, the Center encourages the sharing of early pre-publication concepts among its faculty so that hypotheses flow more freely, are tested more rapidly, and guide future directions for the Center, an approach that already has been successful in paving the way for new therapeutic approaches to treat and diagnose affective illnesses.
icahn.mssm.edu/research/affective-neuroscience

RESEARCH CENTERS AND PROGRAMS *continued on page 2* ›

Eric J. Nestler, MD, PhD
Nash Family Professor of Neuroscience; Director, The Friedman Brain Institute; Dean for Academic and Scientific Affairs, Icahn School of Medicine at Mount Sinai

In this issue of The Friedman Brain Institute newsletter we highlight several of our new centers and programs that promote basic, translational, and clinical research of the nervous system and its disorders. Each is interdisciplinary and draws from several departments across the Icahn School of Medicine at Mount Sinai—reflecting the extraordinary degree of integration and collaboration that defines the Institute's work.

The Advanced Neuroimaging Research Program, led by **Priti Balchandani, PhD,** drives the most cutting-edge innovative approaches for brain imaging in humans and animals. **Scott Russo, PhD,** directs the Center for Affective Neuroscience, which integrates state-of-the-art exploration of neural circuits, and their molecular underpinnings, in controlling emotional behavior. **Anne Schaefer, MD, PhD,** recently founded the Center for Glial Biology as a collaborative effort between Mount Sinai and the City University of New York. The Center focuses on the approximately 50 percent of non-nerve cells that comprise the nervous system and are key determinants of health and disease. The Center for Neurotechnology and Behavior, directed by **Paul Slesinger, PhD,** serves as a nexus to capture synergies that exist among the many transformational experimental tools used by Mount Sinai faculty to study the brain. Finally, the Ronald M. Loeb Center for Alzheimer's Disease, under the leadership of **Alison Goate, DPhil,** is leading Mount Sinai's efforts to understand the genetic and molecular basis of a range of neurodegenerative disorders and advance those discoveries into the clinic.

They are just a subset of the efforts underway at The Friedman Brain Institute to propel our bold research and clinical programs. In the Spring 2018 newsletter, we spotlighted our new Center for Advanced Circuit Therapeutics, directed by Helen Mayberg, MD (https://icahn.mssm.edu/research/advanced-circuit-therapeutics). The Seaver Autism Center for Research and Treatment, led by Joseph Buxbaum, PhD, which is celebrating its 25th anniversary, will be the subject of our Spring 2019 newsletter. For a complete listing of The Friedman Brain Institute's exciting centers and programs, please visit https://icahn.mssm.edu/research/friedman/research/centers-institutes.

› RESEARCH CENTERS AND PROGRAMS AIM FOR BOLD DISCOVERIES *continued from page 1*

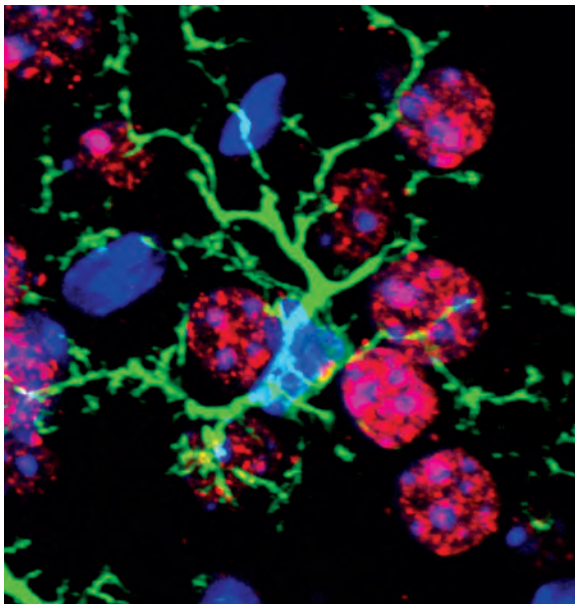


Image shows a striatal microglia (green) that is surrounded by histone H3 lysine 3 trimethylation positive (red) medium spiny neurons. Nuclei are shown by DAPI (blue).

Credit: Pinar Ayata, PhD, Postdoctoral Fellow, Schaefer Laboratory

Center for Glial Biology

The newly established Center for Glial Biology is a multidisciplinary research and clinical program between The Friedman Brain Institute and the Advanced Science Research Center at the City University of New York that promotes the study of glial cell development and function. At a time when glial cells—traditionally considered "support cells" in the brain—are beginning to take center stage as major players in health and disease mechanisms, this joint initiative was created to unlock new approaches to advance understanding of how the brain works. Representing roughly half of all cells in the central nervous system, glial cells, including astroglia, oligodendroglia, and microglia, have a crucial part to play in brain function and metabolism. Yet, their exact role is only beginning to be addressed, making research in this area an important frontier.

The initiative, the first of its kind in New York City, is merging the talents of world-class researchers, the power of revolutionary technologies, and the creativity of new ideas from both institutions in the pursuit of novel insights and innovations. Through this synthesis of talent and technology, the Center for Glial Biology is uniquely positioned to make significant contributions to the field of neuroscience research, and, ultimately, to improve the lives of patients striving to overcome a range of neurological and psychiatric disorders. Led by Directors **Anne Schaefer, MD, PhD** (who joined Mount Sinai in 2011), and **Patrizia Casaccia, MD, PhD** (a part-time member of the Mount Sinai faculty), the mission of the Center is to integrate front-line basic research, enhance interdisciplinary interactions, develop novel cutting-edge technologies, share information, and apply our findings to advance drug discovery and to promote human health.
icahn.mssm.edu/research/glial-biology

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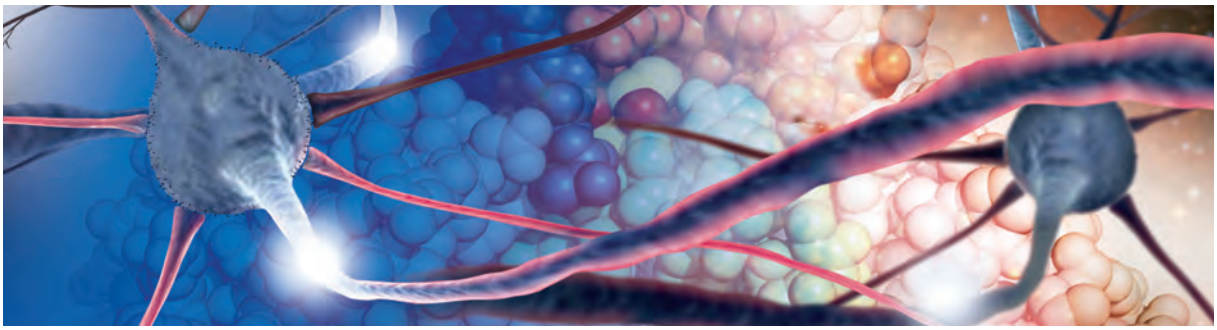


From molecules to circuits: drawing is of interconnected neurons in foreground with atomic resolution structure of an ion channel featuring a "druggable" pocket in the background.

Credit: Designed and created by Danny Roldan, Web Development Coordinator, with guidance from Paul Slesinger, PhD

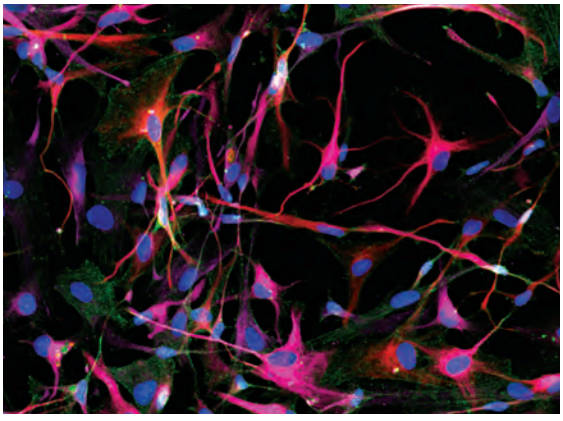
Center for Neurotechnology and Behavior

The Center for Neurotechnology and Behavior, established earlier this year by **Paul Slesinger, PhD,** who joined the Mount Sinai faculty from the Salk Institute in 2012, brings together researchers in neuroscience at Mount Sinai who are focused on elucidating the function of brain circuits in normal and diseased states. The Center's members are currently probing neural circuits involved in Alzheimer's disease, anxiety, depression, drug addiction, Parkinson's disease, and several other disorders of the brain and nervous system.

A core responsibility of the Center is to support the development and implementation of creative technical approaches, such as optical sensors for detecting neurotransmitters, the photo-activation of neurotransmitters, the imaging of neuronal activity with cellular precision, and novel molecular genetic tools for dissecting neural connections in microcircuits in awake, behaving rodents, nonhuman primates, and humans in the context of sophisticated behavioral testing. The Center robustly promotes collaborative studies by hosting monthly scientific presentations for the exchange of data, providing resources to support the career development of our innovative young scientists, and recruiting new investigators to continue the technological revolution currently underway in the neurosciences. Guided by the belief that there are new tools to be forged, new questions to be asked, and entirely new paradigms to be imagined, the Center helps place Mount Sinai at the forefront of scientific discoveries that reach beyond the laboratory.
icahn.mssm.edu/research/neurotechnology-behavior

Ronald M. Loeb Center for Alzheimer's Disease

Using breakthroughs in genomics, neurobiology, and stem cell engineering, among other disciplines, the Ronald M. Loeb Center aims to develop novel therapeutics for Alzheimer's disease (AD) and other neurodegenerative disorders. Human genetic studies form the foundation of the Center's approach of identifying genes and pathways that are implicated in risk or resilience to disease.



Homogeneous population of human astrocytes co-express astrocyte specific markers, glial fibrillary acidic protein (GFAP: red), and S100 calcium-binding protein B (S100B: pink) intracellularly, and glutamate aspartate transporter on the cell surface. Co-expression of GFAP and S100B displays high-intensity magenta, and nuclei are visualized by DAPI (blue).

Credit: Julia TCW, PhD, Postdoctoral Fellow, Goate Laboratory

Since the Center's founding three years ago by trailblazing neuropsychiatric researcher and molecular geneticist **Alison Goate, DPhil** (who joined Mount Sinai from Washington University School of Medicine in St. Louis), researchers have made groundbreaking observations demonstrating that dysfunction of immune cells in the brain called microglia (see the Center for Glial Biology on page 2) plays a causal role in risk for AD. Specifically, they identified a network of genes, expressed in microglia, that are enriched for AD risk/resilience genes. In the next five years, investigators will use experimental and computational approaches to identify novel therapeutics that target this network. The Center also plans an expansion of its clinical translational program through recruitment to strengthen its biomarker program. A biomarker is a biological characteristic that is objectively measured and evaluated as an indicator of normal biological or pathological processes, or as a response to a therapeutic intervention. To move this science forward, it is imperative to develop novel biomarkers to improve diagnosis and measure therapeutic response to drugs for AD and a range of related illnesses. Toward this goal, and in collaboration with colleagues in the Department of Neurology, the Center recently recruited **Trey Hedden, PhD,** from Harvard University, a leading expert in neuroimaging in aging and AD.

icahn.mssm.edu/research/loeb-alzheimers

Richard and Susan Friedman Reinvest in Brain Research and Treatment

In 2010, Mount Sinai named its neuroscience enterprise The Friedman Brain Institute (FBI) in gratitude for the munificent support of Richard and Susan Friedman during the last fundraising campaign. Now, in anticipation of a new fundraising effort—in which The Friedman Brain Institute is a key priority—the Friedmans have once again led by example with an extraordinary commitment of $15 million. The FBI will use $12.5 million to support recent and new top recruits in the areas of neurology, neuroscience, neuroimaging, and psychiatry. The remaining $2.5 million will be dedicated to scholarships to provide more financial support to students at the Icahn School of Medicine at Mount Sinai who face rising costs. The Friedmans recognize the importance of attracting the best students and financially supporting them at the beginning of their careers. To honor Richard and Susan Friedman's generosity, Mount Sinai is pleased to bestow the name of Friedman Hall on the lecture auditorium located on the 12th floor of the Annenberg building. Icahn School of Medicine at Mount Sinai and FBI leadership are extremely humbled by this show of support and grateful for their transformational gifts as the FBI continues to make progress toward reaching its campaign goal of $106 million.

Eric J. Nestler, MD, PhD

10th Anniversary FBI Retreat

The Friedman Brain Institute held its 10th anniversary retreat on Friday, April 27, at the New York Academy of Medicine. The event highlighted work underway in the several hundred laboratories and clinics that comprise the Institute, featured several short talks by neuroscience graduate students and postdoctoral fellows, and presented 124 abstracts. Alison Goate, DPhil, Director of the Ronald M. Loeb Center for Alzheimer's Disease (see page 3) gave the keynote address. More than 400 students, postdocs, faculty, and staff registered for this year's retreat, a striking increase over the approximately 150 registrants at the first retreat in 2009.

Lab Coat Ceremony—A New Tradition!

On Monday, September 17, the Graduate School of Biomedical Sciences at Mount Sinai held its inaugural PhD Lab Coat Ceremony—the only institution in New York City, and one of the few in the country, to honor its PhD students in this fashion. The ceremony, intended to become an annual event, recognized Mount Sinai's entering class of new PhD students in Biomedical Sciences, Neuroscience, and the Medical Scientist Training Program.

Celebrating 50 years 1968-2018

Icahn School of Medicine at Mount Sinai