

Center for Biomedical Imaging

Annual Report FY2019

(issued September 2019)

The Center for Biomedical Imaging provides the resources to enable basic and clinical scientists to collaborate to discover new insights into normal and disease processes and to apply this knowledge to clinically relevant research.



Introduction & Background

The Center for Biomedical Imaging (CBI) was established by the Board of Trustees in 2010 as a *University Designated Center* under the direction of the Provost for Research. This decision has enabled MUSC to remain competitive with other academic institutions and to establish the infrastructure and environment to support this crucial research area.

The CBI central offices are located on the second floor of the Bioengineering Building at 68 President Street. The CBI is a resource for basic and clinical scientists collaborating to discover new information about normal and disease processes and how to apply this knowledge to clinically relevant research. Central to the mission objectives of the CBI are 1) service to the MUSC imaging research community, 2) training and mentorship of graduate students and future leaders in biomedical imaging, 3) recruitment of outstanding senior and young investigators, 4) discovery of new clinical applications of imaging and their practice in the clinical arena and 5) promotion of basic research in medical imaging and related fields. The CBI's website can be found [here](#).

In fiscal year 2019, the CBI provided imaging support and resources for a total of 75 grants, 57 of which were federal grants to MUSC. The CBI also supports MUSC faculty by providing development time to be used for collaborations and the collection of pilot data. In FY2019, the CBI underwrote approximately \$208K of this development time for MUSC researchers

Mission Statement:

The mission of the CBI is to provide the leadership and infrastructure in the imaging sciences necessary for basic and clinical scientists to collaborate, discover new ways to study normal and disease processes, to develop and apply this knowledge to clinically relevant research, and to translate these advances to the patient community while providing a quality graduate education environment.

Vision Statement:

The vision of the CBI is to be recognized as an integrated and multidisciplinary center for biomedical imaging research with mutually supportive and valued interactions among basic science and clinical departments, and it will help recruit outstanding faculty and educate the future leaders of the field.

Administration

General:

In FY2019, the leadership of the CBI included:

Dr. Joseph A. Helpern, Director 07/01/2018 – 12/31/2018
Dr. Jens H. Jensen, Interim Co-Director 01/01/2019 – 03/31/2019,
Interim Director 04/01/2019 – 06/30/2019
Dr. Brett E. Froeliger, Interim Co-Director 01/01/2019 – 03/31/2019
Dr. Truman R. Brown, Scientific Director 07/01/2018 – 06/30/2019

CBI Internal Advisory Committee:

The CBI's Internal Advisory Committee (IAC) comprises the CBI Directors as well as both early stage and senior researchers from across the University. Many of these individuals are experienced in participating in large research programs as well as in the management of shared facilities. The IAC advises the Director on the administrative operation of the CBI, coordinates resources, and ensures that the research conducted within the CBI is appropriately prioritized to reflect the overall goals of MUSC.

Members of the IAC in FY2019 were:

Mr. Joseph Bennett	Dr. Joseph A. Helpern
Dr. Kathleen Brady	Dr. Jens Jensen
Dr. Truman Brown	Dr. Peter Kalivas (Chair)
Dr. Craig Crosson	Dr. Steven Kautz
Dr. Christopher Davies	Dr. Lisa McTeague
Dr. Brett Froeliger	Dr. Thomas Uhde

CBI leadership holds regular "Advisory Committee Meetings" as well as "Town Hall Meetings" in which all users were able to express their views and opinions. These meetings were held on:

CBI Advisory Committee

October 9, 2018
February 5, 2019
May 7, 2019

Town Hall

August 14, 2018
November 13, 2018
April 22, 2019

Scheduling:

Scheduling of time on imaging systems is performed through a web-based system called Calpendo (<https://musccalpendo.com/>) that allows researchers with approved IRB or IACUC protocols to examine and schedule CBI equipment and facilities.

Operations

Faculty & Staff:

The following full and part-time faculty & staff were employed by CBI in FY2019:

Brown, Truman	Professor, Scientific Director
Clark, Emily	Administrative Coordinator II
Coatsworth, James	3T MRI Program Manager
Doose, Jayce	Biomedical Engineer
Falangola, Fatima	Assistant Professor
Fleury, Tom	Research Specialist III
Froeliger, Brett*	Associate Professor, Director
Garrison, Jill*	Administrative Assistant
Helpern, Joseph	Professor, Director
Henderson, Scott	Program Manager I
Huggins, Teri*	Accounting/Fiscal Manager I
Jensen, Jens	Professor, Director
Lewis, Dave*	Senior Staff Scientist
Nie, Xingju	7T MRI Research Specialist
Purl, James*	3T MRI Program Manager
Roberts, Donna	Associate Professor
Roth, Jennifer*	Administrative Assistant
Sessions, Jennifer*	Program Manager II

*part-year only

Preclinical (Small Animal) Imaging:

The Bruker 7T BioSpec 70/30 MRI scanner is a multipurpose system for high-resolution MR spectroscopy and imaging operating at 7 Tesla (T) located on the second floor of the Bioengineering Building. The 7T MRI is ideal for 2D and/or 3D high-resolution anatomical imaging as well as diffusion, flow, cardiac, dynamic contrast, functional, and chemical shift imaging. This Bruker 7T MRI is now 12 years old; many of its components are obsolete and no longer supported. Therefore, a major upgrade will soon be needed in order keep this scanner operational. During the past year, 4 funded studies and multiple pilot projects utilized this resource.

Human imaging Resources:

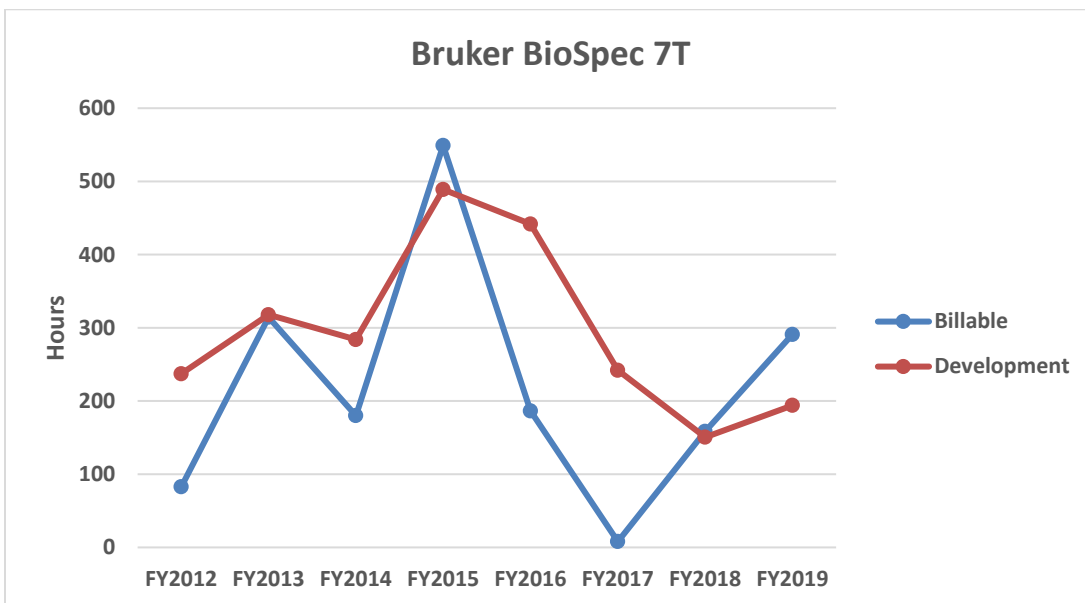
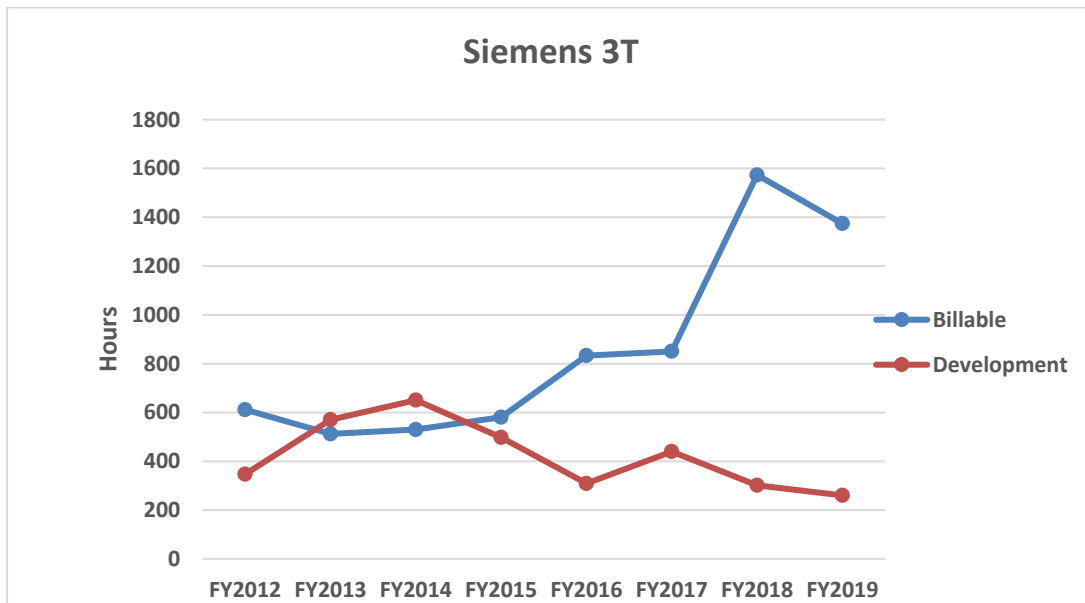
Human MRI studies take place in the CBI's 30 Bee St. facility, which houses a 3T Prisma^{fit} MRI system, four interview rooms, office space, a mock scanner, and a waiting area for subjects. In FY2017, the CBI upgraded the Siemens MAGNETOM Trio 3T MRI system to a Siemens MAGNETOM Prisma^{fit} 3T MRI system. Since then, this upgrade has significantly impacted a multitude of National Institutes of Health (NIH) funded researchers (as well as researchers funded from other sources) in the fields of substance abuse, addiction, aging, Alzheimer's disease, Parkinson's disease, attention-deficit hyperactivity disorder and stroke in addition to basic science brain research. The current system is the only human MRI research scanner at MUSC and one of only two human research scanners in South Carolina. The mock scanner is a full-size replica of the 3T MRI made from plywood and other building materials to look and sound like the real MRI. It is available to be used for 'trial runs' with patients who are wary of undergoing the full

scanning procedure and can be also booked for use as a training or demonstration tool.

Equipment Usage:

The CBI houses a state-of-the-art Siemens 3T MAGNETOM Prisma^{fit} MRI scanner, which operates with a 100% mandate for research. The system is also covered by a Master Research Agreement with Siemens Medical. Preclinical imaging space is located in the Bioengineering Building which houses a Bruker 7T animal MRI system, a surgery room, as well as wet and dry labs, classrooms, and an auditorium.

Shown in the figures below is the total annual hours used from FY2012 through FY2019 for the Siemens 3T MRI and Bruker BioSpec 7T MRI.



Faculty

The CBI is a large, multidisciplinary group of 28 faculty members and 7 staff representing various clinical and basic science departments at MUSC. Collaboration among faculty in the development of new and cross-disciplinary methodologies is strongly encouraged.

Faculty members contribute imaging-related seminar lectures, provide advice to the CBI leadership, and generally support the overall well-being of the CBI. They are expected to take part in regularly scheduled educational meetings, including the regular CBI seminars series, which provides a forum for researchers to have in-depth technical discussions. Each faculty member is asked to give a lecture on their research to the CBI community approximately every two to three years.

Benitez, Andreana, Ph.D,	Assistant Professor	Neurology
Bonilha, Leonardo, M.D., Ph.D.	Associate Professor	Neurology
Borckardt, Jeffrey, Ph.D.	Professor	Psychiatry
Broome, Ann-Marie, MBA, Ph.D.	Associate Professor	Cell & Molec. Pharmacology
Brown, Truman, Ph.D.	Professor, Scientific Director	Radiology
Chatterjee, Rano, M.D.	Assistant Professor	Radiology
Eckert, Mark, Ph.D.	Professor	Otolaryngology
Falangola, Maria, M.D., Ph.D.	Assistant Professor	Neuroscience
Froeliger, Brett, Ph.D.	Associate Professor	Neuroscience
George, Mark, M.D.	Distinguished University Professor	Psychiatry
Hanlon, Colleen, Ph.D.	Associate Professor	Psychiatry
Harris, Kelly, Ph.D.	Associate Professor	Otolaryngology
Helpern, Joseph, Ph.D.	Professor	Neuroscience
Jenkins, Dortha, M.D	Professor	Pediatrics
Jensen, Jens, Ph.D.	Professor, Interim Director	Neuroscience
Joseph, Jane, Ph.D.	Professor	Neuroscience
LaRue, Amanda, Ph.D	Professor	Pathology & Lab. Medicine
Li, Xingbao, M.D.	Assistant Professor	Psychiatry
Liu, Hesheng, Ph.D.	Professor, Associate Director	Neuroscience
McTeague, Lisa, Ph.D.	Assistant Professor	Psychiatry
Naselaris, Thomas, Ph.D.	Associate Professor	Neuroscience
Prisciandaro, James, Ph.D.	Associate Professor	Psychiatry
Roberts, Donna, M.D.	Associate Professor	Psychiatry
Schacht, Joseph, Ph.D.	Associate Professor	Psychiatry
Spampinato, Vittoria, M.D.	Professor	Radiology
Squeglia, Lindsay, Ph.D.	Associate Professor	Psychiatry
Tipnis, Sameer, Ph.D.	Associate Professor	Radiology
Yu, Xue-Zhong, M.D., M.S.	Professor	Microbiology

Education

Biomedical Imaging PhD Program

Two students (Barbara Marebwa and Emilie McKinnon) completed their Ph.D. work in 2019 under the CBI's Biomedical Imaging PhD program. Two other students (Hunter Moss and Maggie Mae Mell) are still working on their dissertations. Due to budget constraints, the Biomedical Imaging PhD Program has suspended the enrollment of new students until further notice.

Lectures for 2018-2019

The CBI regularly hosts lectures given by both visiting speakers and CBI faculty. Recent lectures include the following:

Date	Presenter	Title	University
09/26/18	Logan Dowdle	Buckle up: A guide to fast fMRI	MUSC
10/10/18	Dorothea Jenkins, PhD	Neonatal brain imaging: Key metrics in translating therapies to babies	MUSC
10/24/18	Colleen Hanlon, PhD	From mapping to modulation: 7 brain imaging studies that have helped pave a novel pathway for addiction treatment	MUSC
11/07/18	Richard Edden, PhD	Edited magnetic resonance spectroscopy	Johns Hopkins Univ.
11/14/18	Bashar Badran, PhD	Exploration and development of emerging forms of neuromodulation	MUSC
12/05/18	Davud Asemani, PhD	Novel Morphometry methods for longitudinal brain studies: Flow-analysis, voxel-based morphometry and deformation-based morphometry	MUSC
12/12/18	John Richards, PhD	About Face!! Brain areas supporting face processing in adults (and infants, children)	Univ. of South Carolina

01/09/19	Kristine Wilckens, PhD	Prefrontal cortex stimulation: enhancement of memory and executive function through slow-wave sleep	Univ. of Pittsburgh
01/23/19	Susumu Mori, PhD	Can computers diagnose brain MR images?	Johns Hopkins Univ.
02/27/19	Hesheng Liu, PhD	Mapping functional connectivity networks in individual subjects for personalized medicine	MUSC
03/13/19	Peter Bandettini, PhD	Mapping human layer-specific activation and connectivity with fMRI	NIH
04/10/19	Catrina Robinson, PhD	Molecular mechanisms underlying diet-induced memory deficits	MUSC
04/24/19	Takashi Sato, PhD	Selective sensory-motor communication in reciprocal connectivity of mouse fronto-parietal cortex	MUSC
05/08/19	Jane Joseph, PhD	Development of the face network: A developing picture from fMRI	MUSC
05/22/19	Joseph Schacht, PhD	Of medicines and magnets: New directions in treatment development for alcohol use disorder	MUSC

Appendix I: Budget

	FY19 Actual Spending				% of Category Total
	Admin 44750	3T 49751	7T 49752	Totals for FY19	
	Revenue				
Scan Revenue	\$ -	\$ 848,925	\$ 54,500	\$ 903,425	85%
Institutional Support	\$ 110,566	\$ -	\$ -	\$ 110,566	10%
FY 18 Roll Over	\$ 53,652.00	\$ -	\$ -	\$ 53,652	5%
Revenue Total	\$ 164,218	\$ 848,925	\$ 54,500	\$ 1,067,643	100%
Expenses					
Payroll					
Total Payroll (salary + fringe)	\$ 95,014	\$ 524,481	\$ 121,411	\$ 740,907	100%
Direct Costs					
Service Contracts*	\$ -	\$ 206,897	\$ 31,487	\$ 238,384	0.00%
Equipment	\$ -	\$ 14,828	\$ -	\$ 14,828	0.00%
Shipping & Postage	\$ 728	\$ 186	\$ 689	\$ 1,603	16.92%
Calpendo License	\$ -	\$ 6,000	\$ -	\$ 6,000	0.00%
Additional Software Licenses	\$ 180	\$ 2,010	\$ -	\$ 2,190	4.18%
Office Supplies	\$ 996	\$ 660	\$ 11	\$ 1,667	23.15%
Med/Sci/Lab Supplies	\$ 851	\$ 831	\$ 1,016	\$ 2,698	19.78%
Animal Per Diem	\$ -	\$ -	\$ -	\$ -	0.00%
Travel	\$ 1,548	\$ -	\$ -	\$ 1,548	35.97%
Internal Service Charges	\$ -	\$ 600	\$ -	\$ 600	0.00%
Total Direct Costs	\$ 4,303	\$ 232,013	\$ 33,202	\$ 269,518	100%
Indirect Costs					
30 Bee Street Lease	\$ -	\$ 29,354	\$ -	\$ 29,354	0.00%
30 Bee Street Security System	\$ 61	\$ 522	\$ -	\$ 582	5.27%
Utilities	\$ -	\$ 9,649	\$ -	\$ 9,649	0.00%
Commercial Insurance	\$ -	\$ 167	\$ -	\$ 167	0.00%
General Repairs	\$ -	\$ 1,205	\$ -	\$ 1,205	0.00%
Environmental Sanitation (Steritech)	\$ -	\$ 283	\$ -	\$ 283	0.00%
Telephone (Centrex)	\$ 1,095	\$ 827	\$ 138	\$ 2,060	94.73%
Building Maintenance (CBI/CAIR)	\$ -	\$ 8,385	\$ -	\$ 8,385	0.00%
Hazard & Flood Insurance	\$ -	\$ 5,531	\$ -	\$ 5,531	0.00%
Total Indirect Costs	\$ 1,155	\$ 55,924	\$ 138	\$ 57,218	100%
Total Expenses	\$ 100,473	\$ 812,418	\$ 154,752	\$ 1,067,643	
Total Revenue less Total Expenses	\$ 63,745	\$ 36,507	\$ (100,252)	\$ 0	

Appendix II: Grants Supported by CBI

PI	Funding Source	Grant Title
Raymond F. Anton	Laboratorio Farmaceutico CT	Effect of GET73 on MRS Measures of Central Glutamate and GABA in Individuals With Alcohol Use Disorder
Andrew Atz	NHLBI	Single Ventricle Reconstruction III: Brain Connectome and Neurodevelopmental Outcomes
Sudie Back	VA	Doxazosin in the Treatment of Co-Occurring PTSD and Alcohol Use Disorders
Sudie Back	DOD	Glial Regulators for Testing Comorbid Posttraumatic Stress Disorder and Substance Use Disorders
Sudie Back	NIAAA	Clinical Trial for Alcohol Use Disorder and Post Traumatic Stress Disorder (PTSD)
Andreana Benitez	NIA	White Matter Tract Integrity Biomarkers of Neurodegeneration in Aging and MCI
Andreana Benitez	Rare Disease Foundation	Imaging Resilience in a Rare Brain Disease
Leonardo Bonilha	AHA	Wide Spectrum Investigation of Stroke Outcome Disparities on Multiple Levels (WISSDOM)
Leonardo Bonilha	NIDCD	Center for the Study of Aphasia Recovery: (C-STAR)
Jeffrey Borckardt	NIDA	RCT of TDCS-Augmented CBT for Veterans with Pain and Opioid Misuse
Mark Bowden	NIGMS	SC Research Center for Recovery from Stroke: Project 2 - Excitatory and Inhibitory RTMS as Mechanistic Contributors to Walking Recovery
Truman Brown	NIH	EEG/fMRI Controlled TMS Real-Time Neural Feedback in Anti-Depressive Treatment
Christine Cooper	NIH/South Carolina Clinical and Translational Research Institute and MUSC Foundation's Charles and Dianne Barmore Fund for Parkinson's research	Brain Circuitry Changes in Vascular Parkinsonism
Christine Cooper	SCTR	Investigation of small vessel disease in Parkinson's disease motor symptoms
Bernadette Cortese	NIMH	Trauma-Related Olfactory Cues in Posttraumatic Stress Disorder
Marian Livingston Dale	Biogen	Study of BIIB092 in Participants With Progressive Supranuclear Palsy (PASSPORT)
Carla Kmett Danielson	NIMH	Threat-Related Negative Valence Systems, Child Victimization, and Anxiety
Mark Eckert	NIDCD	Neuroimaging of Age-Related Changes in Speech Recognition
Adviye Ergul	VA	Cerebral arteriole structure and function in diabetic ischemic stroke
Wayne Feng	NIGMS	SC Research Center for Recovery from Stroke: Project 3 - Optimizing

		Transcranial Direct Current Stimulation Current and Electrode Montage for Stroke Patients
Wayne Feng	Microtransponder, Inc.	A Pivotal Randomized Study Assessing Vagus Nerve Stimulation (VNS) During Rehabilitation for Improved Upper Limb Motor Function After Stroke (VNS-REHAB)
Julianne Flanagan	NIAAA	Oxytocin to Enhance Alcohol Behavioral Couple Therapy
Brett Froeliger	NIDA	Translational Neuropsychopharmacology Research of Nicotine Addition
Brett Froeliger	MUCR 87455 2100010 2021 Sub-Account TSP1	HCC Pilot - Froeliger
Mark George	Neuronetics	A Randomized, sham-controlled trial of the safety and effectiveness of Neurostar Transcranial Magnetic Stimulation (TMS) Therapy in depressed adolescents
Mark George	Other	Focal Electrically-Administered Seizure Therapy (FEAST)
Mark George	Tiny Blue Dot Foundation	Low Intensity Focused Ultrasound Pulses (LIFUP) to Modulate Pain
Evan Graboyes	Hollings Cancer Center	Association of Connectivity Dysregulation with
Chris Gregory	VA	Contract for Neuro-Rehabilitation Engineering Services: Skeletal Muscle Plasticity as an Indicator of Functional Performance Post Stroke
Colleen Hanlon	NIDA	10 Days of MPFC Theta Burst to Improve Clinical Outcomes in Treatment-engaged cocaine users
Colleen Hanlon	NIDA	Longitudinal Study of Functional Connectivity Among Cocaine Users in Treatment
Colleen Hanlon	NIAA	Charleston ARC Clinical Project 4-Cortical rTMS as a tool to change craving and brain reactivity to alcohol cues
Colleen Hanlon	NIH/NIDA	QuitFast: Evaluating transcranial magnetic stimulation as a tool to reduce smoking directly following a quit attempt
Colleen Hanlon	NIH/NIDA	Developing brain stimulation as a treatment for chronic pain in opiate dependent individuals
Colleen Hanlon	SCTR	Developing brain stimulation as a treatment for pain in opiate dependent individuals: Parametric assessment of 2 evidence-based strategies
Colleen Hanlon	NIGMS	SC Research Center for Recovery from Stroke: Project 1 - Investigating the Neurobiologic Basis for Loss of Cortical Laterality in Chronic Stroke Patients
Kelly Harris	NIDCD	Neural Determinants of Sound Encoding in the Aging Ear and Brain
Joseph Helpern	NIA	Quantitative Neuroimaging Assessment of White Matter Integrity in the Context of Aging and AD
Vanessa Hinson	Biogen	Evaluating the Safety, Pharmacokinetics, and Pharmacodynamics of BIIB054 in Participants With Parkinson's Disease (SPARK)
Dorothea Jenkins	COBRE	COBRE discovery pilot

Dorothea Jenkins	F31	Non invasive brain stimulation to improve oromotor function in neonates
Jens Jensen/Fatima Falangola	NIH	Assessing Brain Microstructure in Alzheimer's Disease with Advanced Diffusion MRI
Jane Joseph	NIH	Using Connectomics to Characterize Risk for Alzheimer's Disease
Steven Kautz	VA	The effects of impaired post-stroke coordination and motor pathway integrity on mobility performance
Louis Luttrell	NIH NIDDK	Epidemiology of Diabetes Interventions and Complications Study (EDIC)
Aimee McRae-Clark	NIDA	Neural substrates of emotion: Impact of cocaine dependence
Aimee McRae-Clark	NIDA	Advancing Varenicline as a Treatment for Cannabis Use Disorder
Lisa McTeague	NIMH	REMIEDIATING EMOTION DEFICITS IN PTSD: PROBING AND MODULATING NEUROCIRCUITS
Lisa McTeague	SCTR	Extinguishing Fear and Craving: Neuromodulating Shared Circuits
William Mellick	NIAA	Preliminary Validation of a Novel Natural Rewards fMRI Paradigm: Comparing Relative Brain Activation to Natural Rewards versus Alcohol Cues in Individuals with Alcohol Use Disorder and Social Drinkers
Nicholas Milano	Biogen	221AD301 Phase 3 Study of Aducanumab (BIIB037) in Early Alzheimer's Disease (ENGAGE)
Nicholas Milano	Industry/Roche	A PHASE III, MULTICENTER, RANDOMIZED, DOUBLE-BLIND, PLACEBO-CONTROLLED, PARALLEL-GROUP, EFFICACY, AND SAFETY STUDY OF GANTENERUMAB IN PATIENTS WITH EARLY (PRODROMAL TO MILD) ALZHEIMER'S DISEASE
Jacobo Mintzer	NIA	Memory Improvement Through Nicotine Dosing (MIND) Study (MIND)
Jacobo Mintzer	VA	Effects of traumatic brain injury and posttraumatic stress disorder on development of Alzheimer's disease in Vietnam Veterans using the Alzheimer's Disease Neuroimaging Initiative:
Jacobo Mintzer	NIA	Anti-Amyloid Treatment in Asymptomatic Alzheimer's Disease (A4)
Jacobo Mintzer	NIA	Alzheimer's Disease Neuroimaging Initiative 3 (ADNI 3)
Jacobo Mintzer	NIA	Longitudinal Evaluation of Amyloid Risk and Neurodegeneration - the LEARN Study. A Companion Observational Study to Anti-Amyloid Treatment in Asymptomatic Alzheimer's Disease (A4) Trial
Mushfiquddin Khan	VA	Targeting neuronal NOS/peroxynitrite/calpain
James Prisciandaro	NIAA	Neuroimaging Mechanisms of Overlap between Alcoholism and Bipolar Disorder
James Prisciandaro	NIAAA	Imaging Framework for Testing GABAergic/glutamatergic Drugs in Bipolar Alcoholics
James Prisciandaro	NIDA	Gabapentin for Bipolar & Cannabis Use Disorders

James Prisciandaro	NIAAA	Imaging Framework for Testing GABAergic/glutamatergic Drugs in Bipolar Alcoholics
Gonzalo Revuelta	NINDS	Identification of Gait and Imaging Markers for Freezing of Gait in Parkinson's Disease
Gonzalo Revuelta	Other	Effects of Neuromodulation and Rehabilitation of the Locomotor Network in Freezing of Gait (TMS/FOG)
Gregory Sahlem	NIDA	A Preliminary Investigation of Pre-Frontal repetitive Transcranial Magnetic Stimulation (rTMS) for the Treatment of Cannabis Use Disorder.
Michael Saladin	NIDA	Behavioral & Integrative Treatment Development Program
Joseph Schacht	NIAAA	Neural Connectivity and the Transition to Alcohol Dependence
Joseph Schacht	NIAAA	Effects of Cortical Dopamine Regulation on Drinking, Craving, and Cognitive Control
Na Jin Seo	NIGMS	Brain functional connectivity & sensory stimulation-enhanced therapy post stroke
Lindsay Squeglia	NIAA	Neuroscience-Informed Treatment Development for Adolescent Alcohol Use
Lindsay Squeglia	NIDA	The Adolescent Brain Cognitive Development (ABCD) Study
Stephan Tomlinson	VA	Testing targeted complement inhibition in brain injury
Tanya Turan	Mayo Clinic	Carotid Revascularization and Medical Management for Asymptomatic Carotid Stenosis Trial (CREST-2) Trial
Tanya Turan	NINDS	Characterization of Intracranial Atherosclerotic Stenosis Using High Resolution MRI
Kenneth Vaden	NIDCD	Understanding cognitive and neurobiological factors of age-related speech recognition declines



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