The Laureate Institute for Brain Research (LIBR) facilities consist of 28,000 square feet of space in a building that is attached to the Laureate Psychiatric Clinic and Hospital. The neuroimaging and laboratory facilities at LIBR are entirely dedicated to research. They include two MRI scanner bays and a control room, two video-teleconferencing-enabled group meeting sites, several medical examination and patient prep rooms, the computing facility and ample office space for the investigators.

Details of LIBR facilities:
LIBR occupies 28,000 square feet of newly constructed space designed for neuropsychiatric and neuroscience research on the campus of the Laureate Psychiatric Clinic and Hospital.

• 42 offices, including 3 large shared offices for students and volunteers
• 5 conference rooms
• 2 MRI bays and adjoining control rooms
• 3 psychophysiology testing rooms
• 2 behavioral observation rooms
• 2 medical/blood draw rooms
• 1 mock scanner room
• 1 neuropsychological testing room
• 1 transcranial magnetic stimulation (TMS) room
• 2 float rooms
The Laureate Institute for Brain Research (LIBR) continues to grow and have scientific impact. Researchers from LIBR have published over 58 scientific manuscripts in 2019, a 20% increase. We also continue to seek extramural support from governmental agencies. This highly competitive process requires multiple tries and persistence.

Our investigators have applied for eight major grants over the past six months alone. We are being recognized by leaders in the field as a viable and competitive place for neuroscience-based research. Our researchers have been presenting at international conferences as panel participants and are being asked to provide expert opinion for extramural grant applications. Taken together, the institute is growing into a mature, high-level, highly productive brain research institute focused on using neuroscience tools to improve diagnosis, prognosis, and treatment of mental disorders.

The Tulsa 1000 study, which aims to build a comprehensive database of individuals with mood and anxiety, substance, and eating related problems, completed enrollment of all 1,000 subjects in 2018 and continued to complete yearly follow-up visits in 2019. Over the past year, our principal investigators, post-doctoral fellows, and collaborators have begun or continued data analyses toward the publication of over 60 research papers using data from the T-1000, with 12 published or accepted for publication thus far. Currently, investigators at LIBR focus on (1) analysis of the oral microbiome to assess the ability to diagnosis individuals based on characteristics of their microbiome, (2) the emerging role of exosomes in mental health disorders, as exosomes can cross the blood-brain barrier and potentially inform brain dysfunction (3) genetic characterization of disease onset, severity and persistence, as well as epigenetic characterization of disease progression and; (4) digital phenotyping through the relatively novel field of mobile assessments (via Fitbit tracking) and application-based interventions. These are just a few examples showing that this dataset can generate inflammatory responses are one reason for the development of depression.
LETTER FROM THE PRESIDENT

Jerzy Bodurka’s group further advanced the capacity for non-invasive brain modulation with real-time EEG and fMRI neurofeedback (EEG-rtfMRI-nf) training of the amygdala, which is a promising and effective novel non-pharmacological intervention for major depressive disorder (MDD) and post-traumatic stress disorder (PTSD). Beyond advancing the mechanistic understanding of neurofeedback action, such as the correction of abnormal amygdala response and abnormal amygdala connectivity with prefrontal brain regions and the normalization of frontal EEG asymmetry in the alpha band in MDD and PTSD, it is now possible to accurately link symptom improvements at a specific time and over time with other brain regions recruited during neurofeedback amygdala modulation. They also discovered that neurofeedback-targeted brain modulation of the amygdala influences immune responses in MDD, specifically baseline serum concentrations of the pro-inflammatory cytokine, TNF-alpha, predict an individual’s capacity to upregulate the amygdala during rtfMRI-nf training. Results suggest that inflammatory mediators such as the TNF-alpha may constitute a promising treatment response marker for amygdala neurofeedback modulation and could help to better identify treatment responders.

Justin Feinstein commenced the first NIH-funded clinical trial on floating: “Investigating Floatation-REST as a novel technique for reducing anxiety and depression.” He was invited to present the keynote address at the 20th annual International Mental Health Conference in Australia and gave the keynote address at the International Society for the Advancement of Respiratory Psychophysiology meeting in Switzerland. His research studying carbon dioxide and anxiety was also featured this year on the longest running Science documentary on television, The Nature of Things, in a special episode on the Science of Fear.

Robin Aupperle has authored or co-authored 13 publications in 2019 (published or currently in press). This includes results from the TU Tough college resilience study, published in the journal Depression and Anxiety. Results indicate that a brief, four-session resilience program, delivered during first year orientation courses, was effective at reducing symptoms of depression and stress for college students. This semester, Dr. Aupperle worked with TU to implement this training for incoming students within the colleges of Health Sciences, Engineering and Natural Sciences, and Business. Dr. Aupperle and two others in her laboratory (post-doctoral fellow, Dr. Evan White, and graduate student, Tim McDermott) received travel awards from the Society of Biological Psychiatry (SOBP). In addition, she submitted four grant applications in 2019 as either a principal investigator or mentor.

Sahib Khalsa published a primer on interoception in eating disorders for clinicians that provides a clinical summary of the association between the brain and body in eating disorder. He has been able to conclusively show that the practice of meditation is not associated with improved awareness of the heartbeat, suggesting that the long-term effects of meditation may be related to other body systems, such as the breath, or may involve a mechanism independent of interoceptive accuracy. He participated in a conference on interoception organized by the National Institute of Health entitled “The Science of Interoception and its Roles in Nervous System Disorders.” The meeting brought the scientific debate on interoception that was started by the LIBR Interoception Summit to a broader audience of animal and human researchers from all over the world. Another special issue on interoception is underway, and both Martin Paulus and Sahib Khalsa are involved.

In collaboration with his lab and a team of researchers at UCLA, Somatormap was developed. It is a novel mobile tool for assessing body image perception. The initial study, piloted in fashion models, identified body image differences between models and non-models. Ongoing studies are examining whether Somatormap provides a unique way of measuring body image disturbance in eating disorders, which could be useful for the remote detection, monitoring and clinical referral of body image concerns as we begin entering the era of digital psychiatry.

Yoon-Hee Cha who had been focusing on neuromodulation via transcranial magnetic stimulation received a terrific offer from the University of Minnesota, which also brought her closer to her family and moved to Minneapolis in the summer. She will continue her work on modulating the cerebellum in anxious individuals to begin to identify novel brain targets for neuromodulation of anxiety. She will continue to collaborate with LIBR in the future.

Jenny Stewart co-authored ten publications pointing to potential diagnostic/predictive markers in individuals with mood, anxiety, substance use, and eating disorders. A current theme across most of these papers is that individual differences in disorder presentation, symptoms, and/or brain/behavioral function matter. For example, (1) although depressed people have unhealthy diets, the type of appetite change they experience during their current depressive episode is related to what type of inflammation they experience: diet-based (decrease) or blood-based (increase) (Burrows et al., in press); (2) although women with eating disorders show brain and behavioral biases toward/away from food and body-related stimuli, these biases are more consistent when we focus within specific symptom clusters (e.g., anorexia versus bulimia versus binge-eating), and an important symptom of anorexia, perfectionism, has been understudied but may be an important marker of disease progression/severity (Ralph-Nearnman, et al., 2019); (3) brain and behavioral markers of methamphetamine and opioid use disorder are not identical, such that methamphetamine use frequency/recency is specifically associated with cardiac problems (Stewart, Khalsa, et al., 2019); and (4) individual differences in frontal lobe function predict treatment success and recovery for people with posttraumatic stress disorder (Butt et al., 2019) and stimulant/opioid use disorders (Stewart, May, Aupperle, et al., 2019; Stewart, May, & Paulus, 2019). Jenny has an additional 15 papers under review, most coauthored with LIBR post-docs, grad students, principal/associate investigators, and staff. Jenny has also had a fun and productive year working with LIBR’s ten post-docs on career development, talks/conference presentations, and paper/grant submissions. Last but not least, Jenny is working on the resubmission of her ROI grant application to the National Institute on Drug Abuse entitled “Interoception adaptations during recovery from opioid and stimulant use disorders” (scored a 4.4 in the 35th percentile, by the grants review panel on her first submission). Jenny is really enjoying her work at LIBR and is committed to staying in Tulsa for the long-haul (she is closing on her first house in early January 2020).
Associate Investigators

We have created the track of Associate Investigator to provide up-and-coming young research talent a way to grow into the LIBR family of investigators. The idea is that we will see some of these researchers as principal investigators in the near future. We are very excited to have three extremely talented individuals who have been outstandingly productive this year.

**Hamed Ekhtiari** has been working on using neuroscience-based training of individuals with substance-use problems to enhance abstinence. This work is based on translating complex neuroscience constructs into easy-to-understand cartoons. His work has received international attention and his cartoons have been translated into over 15 languages. This approach was recognized by the Oklahoma Center for the Advancement of Science and Technology with a two-year grant to develop this approach as an intervention for individuals with substance-use disorders. He has recently developed a series of brain imaging tasks with drug cues for methamphetamine and opioid users to explore neural correspondence of drug craving. Moreover, he has been working with the LIBR team to use transcranial direct and alternating current stimulation to target these neural targets involved in drug craving to help substance users remain abstinent in long-term.

**Namik Kirlic** has been investigating mindfulness-based interventions in teens who have experienced adverse life events growing up. In 2019, he completed a small pilot grant awarded through Oklahoma State University where he showed that mindfulness can significantly reduce symptoms of depression in these teens. In addition, he was awarded another grant to investigate whether we can use brain training to enhance mindfulness practice and further improve outcomes. His long-term goals of using sophisticated brain imaging and behavioral intervention focused on trauma-related problems with mental health will have significant impact and will be highly relevant for young people in Oklahoma.

**Ryan Smith** is focused on bringing a computational framework to the questions we are asking at LIBR. In particular, he is using an active inference approach, which provides a way of explaining how individuals act to make the most preferred outcome more likely. He has been very prolific in 2019. He published 13 journal articles, has four under review and five more in preparation. He is working on multiple collaborative projects with researchers at University College London, the Max Planck Center in London, Yale University and McGill University. Ryan mentors a graduate student at the University of Melbourne as part of a collaborative computational modeling project. He has presented his work at four conferences and is preparing to submit a K-Award application to NIH.

The post-doctoral fellow is the quintessential researcher that is bound to make the most discoveries because she/he focuses exclusively on analyzing and publishing research data. LIBR has added five new post-doctoral researchers in 2019 who will focus their efforts on analyzing collected data and publishing the results in scientific journals. We welcomed Leandra Figueroa-Hall, Ph.D., Hiaxia Zhang, Ph.D., Philip Spechler, Ph.D., Evan White, Ph.D., and Adam Teed, Ph.D.

Taken together, 2019 has been a productive year for LIBR. We recognize that the suffering of individuals with psychiatric disorders is current and pressing. Therefore, the is a sense of urgency to push the field to apply neuroscience to identify objective markers for disease and to use these tools for innovative treatments. There is light at the end of the tunnel but we are not there yet.
The goal for LIBR is to generate impactful research (knowledge) that makes a difference in mental health. That is, the principal product of LIBR is knowledge building. In order for knowledge to be impactful, it needs to change behavior of the stakeholders and, as a consequence, improve the quality of life of the mentally ill. This change in behavior could be applying a new treatment, providing information to the patient that affects their behavior to improve outcomes, changing the strategy of treatment based on novel assessments or providing information about likely outcomes in the future. A critical task in creating impactful knowledge at LIBR is to shorten the gap of time between the acquisition of knowledge and the implementation in clinical practice. This gap of time will be greater if production of knowledge focuses on basic processes underlying the pathophysiology of the disorder as opposed to changing behavior. Therefore, we need to be mindful of creating knowledge that will affect mental health in the short-term as well as the long-term.

THERE IS A NEED FOR:

1. Earlier detection of the development and/or exacerbation of mental health conditions, e.g., early but not late stages of mood disorder may be treatable with an anti-inflammatory agent.

2. Sensitive and specific tests for severity of mental health conditions, e.g., predicting relapse may allow the clinician to intervene earlier.

3. Earlier and sensitive detectors of treatment effects of interventions for mental health conditions, e.g., rather than waiting four to six weeks for an antidepressant to show significant effects, early changes may help select treatments that work faster.

4. Detection of the emergence of side effects.

5. More effective interventions for anxiety, depression and substance disorders.

BEHAVIORAL PROCESSES
This research theme focuses on identifying the physiological bases for drives and behaviors that contribute to the development, maintenance or recovery from neuropsychiatric dysfunction to improve the assessment and treatment of mental and physical health.

NEUROIMAGING
This research theme focuses on the existing and emerging tools and techniques in multimodal imaging.

NEUROMODULATION
This research theme focuses on real-time feedback modalities and non-invasive brain stimulation to change dysfunctional processes in psychiatric populations.

PSYCHOPHYSIOLOGY
This research theme focuses on the use of physiological measures to examine the connection between body and brain.

BIOASSAYS
This research theme focuses on the use of biochemical measures, ranging from inflammatory markers to microbiome assessments to genetics.

LIBR LEADERSHIP

Tom Cooper, MBA
Chief Executive Officer

Martin Paulus, M.D.
Scientific Director and President

Colleen McCallum, MBA
Chief Operating Officer

Jerzy Bodurka, Ph.D.
Chief Technology Officer
**LIBR BY THE NUMBERS 2019**

- **58** journal article publications by LIBR investigators
- **2,545** participants enrolled across all studies
- **3,835** inquiries for study participation
- **1,772** Magnetic Resonance Imaging (MRI) scanning sessions
- **100+** poster presentations and talks at conferences and universities
- **8** staff scientists
- **4** associate adjunct investigators
- **6** active grants and clinical trials
- **228** participants enrolled in their first MRI study
- **9** post-doctoral fellows
- **1** new externally funded grant
- **$2.6 million** in external grant funding
- **8** principal investigators
- **10** graduate students
- **2019 FUNDING SOURCES**
  - National Institute of Drug Abuse (NIDA)
    - Adolescent Brain Cognitive Development (ABCD) Study
      - PI: Martin Paulus, M.D.
      - 09/30/2015 – 05/31/2020
    - J4E Planning for the NEALthy Early Development Study
      - PI: Jerzy Bodurka, Ph.D.
      - 09/30/2019 – 09/30/2021
  - National Institute of Mental Health (NIMH)
    - Common and Distinct Interceptive Phenotypes of Anorexia Nervosa and Panic Disorder
      - PI: Martin Paulus, M.D.
      - 03/1/2017 – 03/31/2022
    - Approach-Avoidance Conflict: A Multi-Level Predictor for Exposure Therapy Response
      - PI: Robin Kappel, Ph.D.
      - 04/12/2016 – 04/30/2021
    - Acute modulation of neural circuitry regulating immune function in depression
      - PI: Jonathan Savitz, Ph.D.
      - 08/01/2018 – 07/31/2020
  - National Institute of General Medical Sciences (NIGMS)
    - The Center for Neuroscience-based Mental Health Assessment and Prediction (NeuroMAP)
      - PI: Martin Paulus, M.D.
      - 09/15/2017 – 06/30/2022
    - Dyadic Inter-Brain Signaling Project
      - PI: Jerzy Bodurka, Ph.D.
      - 02/01/2017 – 03/31/2021
  - National Center for Complementary & Integrative Health
    - Investigating Flotation-REST as a novel technique for reducing anxiety and depression
      - PI: Justin Feinstein, Ph.D.
      - 09/25/2018 – 07/31/2021
  - Brain and Behavior Research Foundation (formerly NARSAD)
    - Examining the Utility of Frontoinsular Synchronization to Moderate Drug Craving to Enhance Self-Control to Cue-Induced Cravings in Individuals with Opioid Use Disorder
      - PI: Hamed Ekhtiari, M.D., Ph.D.
      - 01/15/19 – 01/14/21
  - Oklahoma Center for the Advancement of Science and Technology (OCAST)
    - Neurocognitive Empowerment for Addiction Treatment (NEAT): A Randomized Controlled Trial for Opioid Addiction
      - PI: Hamed Ekhtiari, M.D., Ph.D.
      - 07/01/18 – 07/31/21
  - The William K. Warren Foundation
    - Jean M. Warren Fund
  - 2019 DONORS
    - Marie Elise Howard Fund
    - John J. King, Jr.
    - Saxifrage Summit Partnership, LTD c/o John J. King, Jr.
    - Christopher W. King
    - CWK Ventures, LLC c/o Christopher W. King
    - Judith King
    - J. Falcon, LTC c/o Judith King
    - Margaret King Kelley
    - Overall Five, LTD c/o Margaret King Kelley
    - Constance King Cowett
    - DWK Legacy, LTD c/o Constance King Cowett
    - Natalie Bryant
    - W. Kelly VanDever Revocable Trust
    - William K. Warren, Jr., LLC
    - Stephen K. Warren, Trust A
Tulsa 1000 Study
The Tulsa 1000 (T-1000) study, the largest study at LIBR, began in January 2015 and completed baseline enrollment of all 1,000 participants in 2018. Participants with disorders of mood and anxiety, eating and substance use completed over 24 hours of baseline testing, including clinical interviews and behavioral and neuromaging assessments of emotion, cognition, reward and interoception. Longitudinal assessments will continue throughout 2020. The goal for this study is to determine whether neuroscience-based measures can be used to predict outcomes in patients with mental illness. In particular, we are trying to determine what factors best predict who will respond well to a particular treatment. The study is a definitive step towards developing a science-based personalized medicine approach in mental health.

To date, 12 papers have been published by the T-1000 project authors and their collaborators. An additional five were under review at the end of 2019. Data analysis of the T-1000 variables is ongoing, with over 60 individual scientific papers in progress for publication. Publications thus far have covered the topics of the relationship between gray matter volume and childhood trauma, the development of automatic pipelines for pre-processing EEG-MRI data, EEG microstates as an electrophysiological signature of BOLD resting state networks and characterization of abnormalities in mood and affective disorders, the prediction of brain age from EEG signals using a machine learning approach and the relationship to chronological age, the effect of neighborhood factors on brain structure and function, how body characteristics predict motion in the scanner, how early life stress and adult cytomegalovirus infection are related in mood and anxiety disorders, and how processing of body signals differs in individuals with opioid and stimulant use disorders.

The Tulsa 1000 investigators include the following contributors: Robin Aupperle, Ph.D., Jerzy Bodurka, Ph.D., Justin Feinstein, Ph.D., Sahib S. Khalsa, M.D., Ph.D., Rayus Kuplicki, Ph.D., Martin P. Paulus, M.D., Jonathan Savitz, Ph.D., Jennifer Stewart, Ph.D., Teresa A. Victor, Ph.D.

In addition to publications, bi-weekly discussions of data analysis pathways and scientific findings with the principal investigators, associate investigators, staff scientists, and post-doctoral fellows offer opportunities for new ideas to explore as we work towards developing a personalized treatment approach through the knowledge gained with this comprehensive dataset.

ABCD Study
The Adolescent Brain Cognitive Development (ABCD) study is continuing strong starting the fourth year of annual assessments in September. Through the hard work of our ABCD team, the LIBR site has a 99.11% retention rate.

During 2019, the ABCD grant had to go through an NIH renewal requiring a new grant submission as well as progress during the first five years. LIBR was excited to receive the best score of 18 on our renewal and will receive funding for the ABCD for the next seven years.

Our ABCD team is working on data analysis, with several papers on screen media and mental health being submitted during 2019. Our latest submission, “Prevalence and family-related correlates of suicidal ideation, suicide attempts, and self-injury in children aged 9-10,” has been accepted to JAMA Open Network.

The LIBR ABCD team has also been working hard on ensuring we are sharing our results with the ABCD collaborators and Tulsa community with our annual update and party, as well as reports on local and national media. We also had the opportunity to showcase our ABCD work on a documentary, “Screen generation: a sick generation?” with Arte television, expected in 2020.

2019 AWARDS

BART FORD, PH.D., CANDIDATE AWARDED TRAVEL AND RESEARCH PRESENTATION AWARDS
Congratulations to Bart Ford, graduate student at The University of Tulsa, in the Savitz Lab, for receiving the Michael Irwin Diversity and Equity Award for the 2019 Psychoneuroimmunology Research Society (PNIRS) Conference in Berlin, Germany. He presented his work on “Reduced immunity to measles and rubella, but not polio in adults with major depressive disorder: a follow up study.”

At the University of Tulsa’s Student Research Colloquium, Bart Ford was awarded first place for his oral presentation on “T-cell subsets associated with cytomegalovirus and family history of mood disorder.” As well, he was awarded third place for his poster presentation on the same topic at the University of Oklahoma Research Forum in the Biomedical category.

GEOFFREY BURNSTOCK AWARD PRESENTED TO DR. SAHIB KHALSA
Dr. Sahib Khalsa received the Geoffrey Burnstock Award from the International Society of Autonomic Neuroscience. This was the only award given at the meeting, which is held every two years, and was based on outstanding presentation of research at the meeting. The talk was titled: “Association between bilateral cardiac sympathetic denervation and mental health.” A total of four awards were distributed at the meeting, all other recipients were animal researchers conducting basic neuroscience.

GRINDLEY GRANT AWARDED TO DR. CHRISTINA RALPH-NEARMAN
Dr. Christina Ralph-Nearman, a postdoctoral scholar in the Khalsa lab, received a Grindley Grant from the Experimental Psychology Society in January 2019 to attend the annual meeting.

UNIVERSITY OF TULSA UNDERGRADUATE RESEARCH AWARD GIVEN TO MEGAN SINIK
Megan Sinik, an undergraduate research volunteer from The University of Tulsa in the Khalsa lab, received an honorable mention at The University of Tulsa’s annual undergraduate research colloquium, for her talk titled: “Relationship between psychotropic medication use and suffocation fear.”

“RISING STAR” AWARD AWARDED BY RACHEL LAPIDUS
Rachel Lapidus from the Khalsa Lab, and graduate student at The University of Tulsa, received the “Rising Star” award from the University of California-San Diego (UCSD) Eating Disorders Center. This was a highly competitive application with only one award given. She presented a poster on “Augmented Interoceptive Exposure Training for Food-Related Fear in Anomia Nervosa: A Proof-of-Concept Study.”

SOCIETY OF BIOLOGICAL PSYCHIATRY TRAVEL FELLOWSHIP AWARDS
Dr. Robin Aupperle, Dr. Evan White and graduate student Tim McCormitt (The University of Tulsa) each received a Society of Biological Psychiatry Travel Fellowship Award to attend the 74th annual scientific conference “Innovations in Clinical Neuroscience: Tools, Techniques and Transformative Frameworks” in Chicago, Illinois, on May 16-18, 2019.

GRADUATE STUDENT TRAVEL AWARD AWARDED BY KELLY COSGROVE
Kelly Cosgrove, graduate student at The University of Tulsa, in the Aupperle Lab at LIBR, received a travel award to attend the 2019 Society for Research in Child Development biennial meeting.

UNIVERSITY OF WASHINGTON FELLOWSHIP AWARDED TO DR. EVAN WHITE
Post-doctoral research associate, Evan White, in the Aupperle Lab, was awarded the Indigenous Substance Abuse, Medicines and Addictions Research Training Fellowship from the Indigenous Wellness Research Institute at the University of Washington.

Indigenous Substance Abuse, Medicines and Addictions Research Training Fellowship

The Laureate Institute for Brain Research is home to the world’s first research laboratory investigating the effects of floatation therapy on both the body and the brain, as well as exploring its potential as a therapeutic treatment for promoting mental health and healing in patients who suffer from anxiety and other forms of mental illness.

Flotation therapy allows the nervous system to naturally enter a relaxed physiological state by reducing stimulation from the external environment. In a world of 24/7 connectivity, the float experience helps an individual disconnect from this constant stream of stimulation. All visual, auditory, thermal, tactile and proprioceptive input is minimized in our specially designed circular pools. Moreover, each pool is saturated with 2,000 pounds of Epsom salt, allowing individuals to effortlessly float in a bed of water that is denser than the Dead Sea.

Building from this base of knowledge, the FCRC has completed its first set of clinical studies examining the effects of flotation therapy in individuals who have been chronically suffering from high levels of anxiety and stress, including patients with PTSD, panic disorder, generalized anxiety disorder, major depression and anorexia nervosa. Across two different trials that were published in 2018, an open label trial and a randomized controlled trial, the initial data showed very promising short-term effects in these patient populations, with a single float session able to provide significant reductions in stress and anxiety, improving both mood and well-being. Current studies are tracking the time course of these effects as well as studying whether there is evidence for long-term benefit following repeated practice.

In 2019, the FCRC commenced the first NIH-funded clinical trial on floating entitled, “Investigating Flotation-REST as a novel technique for reducing anxiety and depression.” The trial is funded from an R34 grant from the National Center for Complementary and Integrative Health. This unique program of research is just beginning, so please stay tuned as we learn more about how floatation therapy works, and how it can help those who suffer from anxiety, PTSD, depression, anorexia nervosa, and other forms of mental illness.
Brain Awareness for Addiction Recovery Initiative (BARI) started at LIBR to help people who suffer from substance use disorders and their families have a better understanding about how the brain could be affected by drug addiction and how they can help the brain in the process of recovery. Drs. Hamed Ekhtiari, Martin Paulus and Robin Aupperle developed a cartoon, neuroscience-informed psychoeducation (NIPE) package for BARI. NIPE incorporates neuroscience content that targets negative valence (e.g., anxiety and loss), positive valence (e.g., reward), cognitive systems (e.g., attention, executive control, and working memory), social processes (e.g., affiliation), and arousal/modulatory systems (e.g., sleep–wake). NIPE uses cartoons and affiliated text to promote insight and metacognitive awareness, and increase motivation for brain recovery. Some of the NIPE messages are organized in three posters in two different versions for male and female audiences. NIPE posters are translated and culturally adopted by local scientific authorities in 12 languages on five continents so far.

NIPE materials are organized into a structured psychoeducation package for four sessions called “Brain Healing First Aid.” NIPE materials are also incorporated into a larger brain training/rehabilitation program for substance use disorders in 14 sessions (Neurocognitive Empowerment for Addiction Treatment (NEAT)), Brain Gym for Recovery. In a trial funded by Oklahoma Center for Advancement of Science and Technology (OCAST), NEAT is being implemented to promote the recovery process in Tulsa. Furthermore, BARI plans to develop new brain awareness activities/materials to promote brain recovery for other psychiatric disorders, such as mood and anxiety disorders.

In 2017, LIBR was awarded an $11.3 million CoBRE grant from the National Institutes of Health (NIH) to help researchers predict and treat mood and anxiety disorders, resulting in the establishment of NeuroMAP, which includes collaborative efforts from the University of Tulsa and the University of Oklahoma. NeuroMAP provides scientific, operational and educational infrastructure for innovative, neuroscience-based research using individual differences on several biological levels together with sophisticated statistical approaches to generate clinically meaningful predictions of risk and outcomes for mood, anxiety and eating disorders.

**NeuroMAP Includes:**
- A research core of established biomedical research scientists with expertise in mental health, imaging, research laboratories, relevant peer-reviewed funding, and demonstrated leadership and mentoring experience.
- A dedicated mentor and development plan for junior investigators to transition into independently funded investigators.
- Research projects supervised by a single junior investigator that stand alone but share a common scientific focus.

**Individual Research Projects:**
- Predicting Response to Exposure Therapy Using a Carbon Dioxide Challenge in Patients with High Levels of Anxiety Sensitivity
- Response to Inflammatory Challenge in Major Depressive Disorder
- Neural Basis of Interceptive Dysfunction and Anxiety in Anorexia Nervosa
- DB-MindReaL: Augmented Mindfulness Training for Resilience in Early Life

**NeuroMAP**

The Center for Neuroscience-based Mental Health Assessment and Prediction (NeuroMAP)
Family and Children’s Services (FCS)

FCS is devoted to helping families in crisis, and serving people struggling with mental illness, addiction and homelessness. They are committed to the families and individuals of the Tulsa area, helping over 110,000 individuals each year, or one in six Tulsans. As part of LBR’s collaboration, a LBR assessment team member is stationed at FCS and regularly recruits individuals to participate in LBR studies. LBR has continued its research partnership with the FCS Women in Recovery. The intensive outpatient program is an alternative for women facing long prison sentences for non-violent, drug-related offenses. This award-winning program is dedicated to changing the lives of women in Oklahoma and giving them the tools to become positive, contributing members of the community.

12 & 12, Inc.

12 & 12 is an award-winning leader in the Tulsa community for addiction treatment and recovery services. Last year, they served over 1,600 clients in Oklahoma. Through LBR’s established collaboration with 12 & 12’s Clinical Director, Richard Turnham, individuals with substance use-related problems are recruited to participate in LBR studies of addiction.

Laureate Psychiatric Clinic and Hospital

LBR has continued to work closely with our neighbors at the Laureate Psychiatric Clinic and Hospital. Through a “universal consent” process, LBR is able to reach out to Laureate patients to inquire about their interest in participating in research. LBR has extended the partnership to include monthly informational sessions on research studies with participants in the Intensive Outpatient Programs to recruit individuals with substance use and mental health disorders in the Tulsa area.

LIBR works closely with several clinical entities in Tulsa to recruit new participants to LBR research studies.

12 & 12

February 1

Walter Kaye, M.D.

Is Anorexia Nervosa an Eating Disorder?

April 2

Carlos Zarate, M.D.

Deconstructing the Neurobiology of Mood Disorders using Rapid Acting Antidepressant and Anti-suicidal Ideation Interventions as a Bridge to Novel Therapeutics

May 7

Marc Schuckit, M.D.

A 35-year Longitudinal Study of Risk Factors for Alcoholism

August 27

Nora Volkow, M.D.

Drug Addiction as a Disease of the Human Brain

September 4

Richard Davidson, Ph.D.

Cultivating Well-Being: Perspectives From Affective and Contemplative Neuroscience

October 1

Read Montague, Ph.D.

Tilting Back to Neurobiology: Computational Psychiatry in an Invasive Setting

November 19

Peter Kalivas, Ph.D.

Using the Neuroscience of Willpower to Treat Addiction

LIBR 2019 Speakers
LIBR welcomed several visiting scientists to our institute in 2019.

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<td>Lindsay Squeglia</td>
<td>Medication and Cognitive Intervention Trials for Adolescent Substance Use Disorders</td>
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<td>November 20</td>
<td>Konrad Kording</td>
<td>Machine Learning and Causal Inference</td>
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<td>Thomas Wolters</td>
<td>Individual Differences vs. The Average Patient</td>
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<td>December 13</td>
<td>Quentin Huys</td>
<td>Applying Computational Methods to Predicting and Understanding Relapses After Antidepressant Discontinuation</td>
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2019 VISITING SCIENTISTS AND DISTINGUISHED GUESTS

LIBR Celebrates 10th Anniversary
LIBR celebrated our 10th anniversary in 2019 with a catered luncheon and awards ceremony for our staff. Dr. Jerzy Bodurka was presented with the LIBR Pioneer Award for his research excellence and dedication to MRI facilities as LIBR’s Chief Technology Officer and Director of the MRI-EEG Facility.

A Q&A with Dr. Martin Paulus – Tulsa Lifestyle
The January 2019 issue of Tulsa Lifestyle included an interview with Dr. Martin Paulus where he answered questions about ways to stay mentally healthy in the new year, current research studies at LIBR and turning neuroscience-based methods into practical living.

People to Watch: Dr. Martin Paulus is helping to put Tulsa on the map for brain research
Dr. Paulus was featured in a series on “People to Watch” in the Tulsa World. “I think we are seeing things really come together,” Paulus said. “We’re in a really good place. The institute is beginning to get well known. It’s putting Tulsa on the map (for brain research), and that’s significant.”

The Tulsa World's Let's Talk: Mental Health Forum at The University of Tulsa in May 2019 included a panel of experts and special guests who discussed issues connected to the mental health of Oklahomans, including progress, reform, funding and current trends. The panel included TU President Gerard Clancy, a psychiatrist; Terri White, commissioner of the Oklahoma Department of Mental Health and Substance Abuse Services; and Dr. Martin Paulus, scientific director and president of the Laureate Institute for Brain Research.

Dr. Hamed Ekhtiari presented a talk at the TU Lorton Performance Center on February 20, 2019 to discuss “How Our Brain Exerts Self Control.” The talk covered lessons in having better control of attention, learning, memory emotions and impulses.

LIBR’s assessment team braved the chilly weather to greet runners and spectators as a sponsor of the Trojan Tough 5k event for Jenks East Intermediate. They enjoyed meeting everyone who stopped by the LIBR booth for information on research studies, a quick snack, and one of our favorite squishy stress-relief brains.

Amber Selvidge, Director of Regulatory and Compliance and Grants Administrator, represented LIBR at the annual Association of Independent Research Institutes meeting in Washington, D.C. She had the opportunity to connect with the Oklahoma Medical Research Foundation (OMRF) and members of Congress while advocating for continued research funding.
One-in-three college students experience significant depression or anxiety that interferes with their life. Dr. Robin Aupperle and collaborators at The University of Tulsa developed a brief, four-session program aiming to enhance resilience to college stress. They tested the potential benefit of this program for first-year college students at The University of Tulsa who volunteered for the study. Students who received resilience training (compared to those who did not) reported lower levels of depression and stress over the first semester of college. Results indicate that students may benefit from colleges and universities adopting widespread implementation of resilience skills training.

Dr. Martin Paulus and his co-authors were honored with the “Best Environmental Epidemiology Paper Award” from the International Society for Environmental Epidemiology (ISEE). The paper, “Empirical Evidence of Mental Health Risks Posed by Climate Change,” published in PNAS, was recognized for making an outstanding contribution to the knowledge of environmental epidemiology and was selected because of its quality, originality, importance and expected impact.

In August 2019, LIBR enthusiastically welcomed world-renowned addiction researcher, Dr. Nora Volkow, Director of the National Institute on Drug Abuse at the National Institutes of Health to discuss progress, priorities and challenges in drug use and addiction research. Dr. Volkow was instrumental in establishing the Adolescent Brain Cognitive Development (ABCD) study, the largest long-term study of brain development and child health in the country. LIBR is one of 21 sites participating in this landmark research endeavor.

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LIBR was honored to have several researchers present at the 2019 Zarrow Mental Health Symposium, celebrating 25 years of excellence and innovation in mental health. “Resilience. Recovery. Rethink Mental Health,” examined the human capacity to thrive amid adversity. The Symposium brought together 800+ participants from across the region to explore the latest in mental healthcare and treatment.

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Dr. Aupperle’s research focuses on using neurocognitive methods to enhance our understanding of anxiety, depression and trauma. She is particularly interested in:

1. The intersection between cognitive and emotional processing and how this may relate to the development and maintenance of anxiety, depression and trauma-related symptoms.

2. How knowledge from neuroscience research may be used to enhance treatment and prevention efforts.

In regards to the former, she has conducted research related to neuropsychological correlates of trauma and post-traumatic stress disorder (PTSD) and has developed translational exploratory and decision-making tasks to better understand behavioral, physiological, and neural correlates of anxiety and depression. In regards to the latter, she has been involved in research investigating behavioral and neural mechanisms of current pharmacologic and behavioral treatments for anxiety, depression and trauma-related disorders. She is also actively involved in identifying strategies to optimize psychological well-being for college students and examining novel interventions for trauma-related and substance-use disorders.

Dr. Aupperle was born and raised in rural Oklahoma and obtained her bachelor’s degree in psychology from Oklahoma State University. She received her master’s and doctoral education in clinical health psychology at the University of Kansas, under the mentorship of Cary Savage, Ph.D., and Douglas Denney, Ph.D. Her graduate research and clinical education focused on neuropsychology, neuroimaging and anxiety disorders. She then continued out west to complete a clinical internship at the VA San Diego Healthcare System, during which her training focused on clinical neuropsychology, cognitive rehabilitation and treatment of post-traumatic stress disorder (PTSD).

Dr. Aupperle remained in San Diego to complete a postdoctoral fellowship under the mentorship of Drs. Martin Paulus and Murray Stein, conducting research related to neural substrates of anxiety disorders and PTSD, with a particular emphasis on decision-making processes and treatment. She moved to Kansas City to join the University of Missouri - Kansas City (UMKC) Department of Psychology as Assistant Professor in August, 2011. In August, 2014, Dr. Aupperle joined the Laureate Institute for Brain Research (LIBR) in Tulsa, Oklahoma, as Assistant Professor.

SELECTED PUBLICATIONS


RESEARCH COLLABORATORS

Jim Atkinson, M.D., Ph.D. University of Michigan

Michelle Craco, Ph.D. University of California- Los Angeles

Amy Joll, Ph.D. University of California- San Diego

Ari Minhas, Ph.D. Oklahoma State University

Mumpy Steen, Ph.D. University of California- San Diego

Katie Woldsey-Taylor, Ph.D. University of California- Los Angeles

Charles Taylor, Ph.D. University of California- San Diego

Jared Yang, Ph.D. University of California- San Diego

LAB MEMBERS

Elizabeth Akeman Research Assistant

Alyssa Cinard Research Volunteer

Kelly Cosgrove Graduate Student, University of Tulsa

Danielle DeVille Graduate Student, University of Tulsa

Timothy McDermott Graduate Student, University of Tulsa

Jessica Santiago Research Therapist

James Touthang Data Analyst

Evan White Postdoctoral Scholar
Dr. Bodurka's research focuses on three main areas:

1. Non-invasive, multimodal neuroimaging method development and applications for studying brain function including: structural and functional MRI (fMRI), real-time fMRI with neurofeedback, multimodal simultaneous electroencephalography (EEG) and fMRI brain imaging, real-time integration of fMRI and EEG data, simultaneous EEG and fMRI neurofeedback, EEG and fMRI hyperscanning.

2. Novel non-invasive brain neuromodulation and neuroenhancement approaches to better understand brain emotion regulation and social interactions in major depressive disorder (MDD) and post-traumatic stress disorder (PTSD). Dr. Bodurka’s research has shown that the use of real-time fMRI neurofeedback during recall of positive emotions in patients with depression can normalize the neural activity of the amygdala and result in significant depression symptom relief.

3. Translational approaches to discover and research novel therapeutic strategies to improve treatments by training and recovering healthy function of brain networks, and to improve psychotherapy by determining the neural features of socially interacting individuals in MDD and PTSD.

Dr. Bodurka has broad expertise in Nuclear Magnetic Resonance (NMR) and Magnetic Resonance Imaging (MRI) physics. He received his doctorate degree in physics from the University of Nicolaus Copernicus in Torun, Poland, and completed part of his postdoctoral training in NMR at the Department of Chemistry at Free University of Berlin, Germany. As a postdoctoral fellow at Medical College of Wisconsin, he received firm training in MRI technology and functional MRI (fMRI). As a staff scientist at the functional MRI Facility of the National Institute for Mental Health (NIMH) and the National Institute of Neurological Disorders and Stroke (NINDS) and National Institutes of Health (NIH), he was responsible for providing a state-of-the-art imaging environment for conducting advanced MRI and fMRI research. In 2007, for his development of a Scalable Multi-Channel MRI Data Acquisition System, he received NIH’s Director Award for Advancements in MRI Parallel Imaging Technology. The advancements in MRI receiver and multi-element coils technologies allowed for major improvements in MRI signal-to-noise ratio, and pushed spatial and temporal limits for both functional and anatomical imaging. He has also developed an advanced real-time software set-up allowing for conducting real-time fMRI with neurofeedback.

In 2009, Dr. Bodurka joined the newly established Laureate Institute for Brain Research (LIBR) to create a state-of-the-art MRI fMRI/EEG neuroimaging facility and to a establish multimodal brain neuroimaging program with the overall purpose of advancing clinical research focused on mood disorders, with a broad research agenda of advancing our understanding and characterization of brain abnormalities due to mental illness.

SELECTED PUBLICATIONS


RESEARCH COLLABORATORS

Peter Bandettini, Ph.D.
NIH/NIMH, Bethesda, Maryland

Samuel Chang, Ph.D.
University of Arkansas

Pawel Krueger, Ph.D.
George Mason University

Wenee Lai, Ph.D.
Cornell University

Amanda Morris, Ph.D.
University of California – San Diego

Hazem Refai, Ph.D.
University of Oklahoma – Tulsa

Michael Roy, M.D.
Uniformed Services University

Kent Tragardh, Ph.D.
University of Oklahoma – Tulsa

INDUSTRY COLLABORATORS

Patrick Britz, Ph.D.
Brain Products GmbH, Germany

Scott Hinks, Ph.D.
04 HealthCare, Wausau, Wisconsin

Patrick Lueck, Ph.D.
Nova Medical Inc., Wilmington, Massachusetts
Dr. Cha's main research interests include:

1. Exploring the role of the cerebellum in regulating cerebral networks, especially as it pertains to anxiety and depression.
2. Understanding the connection between motion perception disorders, anxiety and migraine headaches.
4. Developing neuromodulation tools that can be accessible to more patients.

Dr. Yoon-Hee Cha is a neurologist with subspecialty training in neurotology. She completed her premedical studies at Stanford University graduating with a degree in biology with honors in 1995. She earned her medical degree from Mayo Medical School in 2001, which included a year of research at the National Institutes of Health through the Howard-Hughes-NIH Research Scholars Program from 1998-1999. In 2002, she completed a preliminary year in internal medicine at the Brigham and Women's Hospital in Boston, Massachusetts, before going on to complete her neurology residency training at the University of California – San Francisco in 2005—she was also chief resident from 2004-2005. From 2005-2007, she was the neurology fellow at the University of California – Los Angeles (UCLA), where she trained with Dr. Robert W. Baloh. She worked with Dr. Baloh on the genetics of episodic ataxia and vestibular migraine. At UCLA, she developed her interest in understanding the neurological basis of motion perception, which led to her current work using functional MRI, EEG and neuromodulation techniques such as transcranial magnetic stimulation and transcranial electrical stimulation to probe the biological basis of and treat disorders of motion perception. She joined LIBR in August 2012. Her current work focuses on a group of patients with a disorder of motion entrainment called mal de debarquement syndrome (MdDS) as well as disorders of spatial processing related to anxiety and migraine. Her work has expanded to include studies that explore the role of the cerebellum in mood and anxiety disorders, particularly in its role in fear conditioning and fear extinction. In conjunction with other LIBR investigators, she is studying how vestibular and cerebellar networks can be targeted to modulate cerebral function.

SELECTED PUBLICATIONS


LAB MEMBERS

B. Chipper Doudican
Research Assistant
Diamond Urbano
Research Assistant and Lab Manager

RESEARCH COLLABORATORS

Walter Besio, Ph.D.
University of Rhode Island
Lei Ding, Ph.D.
University of Oklahoma
Flavio Frolich, Ph.D.
University of North Carolina
Han Yuan, Ph.D.
University of Oklahoma
Dr. Ekhtiari went to Tehran University of Medical Sciences (TUMS), the most distinguished medical school in Iran, as a medical student after passing the highly competitive national university entrance exam with a rank of 11 out of over 350,000 participants. Facing daily challenges of people with substance use disorder (SUD) in Tehran, he became interested in the neuroscience of cognitive disorders associated with SUDs. He received his first small grant as a medical student in this field in 2000, and published his first paper on the “role of prefrontal cortex in risky decision making” in 2001. He graduated from medical school with honors in 2004 with a dissertation on risky decision-making and impulsivity. Immediately, he started work at the Iranian National Center for Addiction Studies (INCAS) in 2004 in one of the least affluent neighborhood in Tehran and launched a neurocognitive lab there in 2005. He also started a research program at Institute for Cognitive Science Studies (ICSS) in Tehran in 2010 called the Translational Neuroscience Program. He enrolled in a Ph.D. program in neuroimaging at TUMS in 2011 and did his thesis project on the neural basis of response inhibition using fMRI. Then, He moved to the U.S. for a postdoctoral position with Dr. Martin Paulus at the Laureate Institute for Brain Research (LIBR). He was promoted to associate investigator position at LIBR in January 2018.

Dr. Ekhtiari started to work in the field of transcranial brain stimulation with an awarded short-term fellowship at Harvard University in 2009. Afterwards, during contribution in different studies using fMRI and brain stimulation, he realized many potentials in this field for understanding causal mechanisms involved in SUD to design therapeutic interventions. In 2014, he published one of the first pieces of evidence on the potential hopes for modulation of drug craving among methamphetamine users with transcranial direct current stimulation (tDCS). His joint review paper on non-invasive brain stimulation and its challenges was published in the Neuron in 2015. In early 2018, he published his preliminary results for the first combined tDCS/fMRI study among people with SUD. He completed his first randomized controlled clinical trial in methamphetamine use disorder at LIBR as a PI with tDCS/fMRI in January 2019 (NCT03382379). In late 2018, he received the NARSAD young investigator award on “examining the utility of fronto-parietal synchronization (FPS) to enhance self-control to cue induced cravings in individuals with opioid use disorders.” He hopes to extend his activities with transcranial electrical and magnetic stimulation (TMS/TES) technologies using fMRI as a biomarker for prediction and monitoring among people with mental health disorders. Dr. Ekhtiari has also focused intensely on the development of cognitive training and rehabilitation programs for people with SUDs. He has recently written a chapter for the world-renowned textbook Neuropsychological Rehabilitation: The International Handbook on brain rehabilitation for psychiatric disorders with specific sections focused on SUDs. In 2014, he conducted his first clinical trial of neurocognitive rehabilitation for people with SUDs, using a package termed “NEurocognitive Rehabilitation for Disease of Addiction” (NECOREDA) in a collaboration with Mehmet Sofuoğlu, Yale University. Results from this study were published in 2017. Based on his background in the field, in collaboration with Drs. Robin Aupperle and Martin Paulus, he recently developed a new package with more in-depth neurocognitive informed interventions called “Neurocognitive Empowerment for Addiction Treatment” (NEAT). In July 2018, he received a three-year grant from Oklahoma Center for Advancement of Science and Technology (OCAST) to run a randomized clinical trial among people with opioid-use disorder with NEAT as PI. Dr. Ekhtiari has already recruited half of the subjects for this trial by the end of 2019. He is planning to extend the idea of brain rehabilitation in drug addiction based on the experiences in this trial.

SELECTED PUBLICATIONS


Mohammad Ali Oghabian, Ph.D. Neuroimaging and Analysis Group Teheran University of Medical Sciences Vincent Walsh, Ph.D. University College London United Kingdom

Hedy Robo University of Vermont

RESEARCH COLLABORATORS
Ali Foroudi, M.D. Neuroimaging and Analysis Group Teheran University of Medical Sciences

Ali Foroudi, M.D. Neuroimaging and Analysis Group Teheran University of Medical Sciences

Mohamed Ali Oghabian, Ph.D. Department of Neuroscience Teheran University of Medical Sciences

Vincent Walsh, Ph.D. University College London United Kingdom

Hedy Robo Yale University

Hugo Varagon University of Vermont

Page 33
Dr. Justin Feinstein joined the faculty of the Laureate Institute for Brain Research in December of 2013 after completing his Ph.D. in clinical neuropsychology at the University of Iowa, and his postdoctoral fellowship at the California Institute of Technology. He earned his undergraduate degree in cognitive neuroscience at the University of California – San Diego. His clinical internship occurred at the San Diego VA hospital and focused on the treatment of veterans with PTSD using Prolonged Exposure therapy.

Dr. Feinstein’s research utilizes the lesion method and functional neuroimaging to explore how the human brain produces primal states of emotion, with an emphasis on the neuroscience of fear and treatments that alleviate anxiety. His laboratory is interested in understanding the intimate connection between the body and the brain, and developing new technologies to help bring this connection to the forefront of awareness. To this end, he is exploring several new approaches that can selectively enhance “interoceptive awareness,” in order to help patients with anxiety establish a healthier balance between their body and brain.

Dr. Feinstein’s three main research areas are to:

1. Develop floatation as a tool for reducing stress and enhancing well-being in individuals who suffer from anxiety.
2. Use functional neuroimaging and the lesion method to help determine the causal source of anxiety in the human brain.
3. Study how the brain dynamically maps the internal world of our body, determine how these maps are dysregulated in conditions of anxiety, and whether floatation therapy can help regulate these disturbances, allowing patients to reshape their internal experience.

SELECTED PUBLICATIONS


Dr. Khalsa received a bachelor’s degree in psychology from The State University of New York – Stony Brook in 2002. He graduated from the medical scientist training program at the University of Iowa, receiving M.D. and Ph.D. degrees in neuroscience in 2009. He completed his residency training in psychiatry at University of California - Los Angeles (UCLA) in 2013, serving as the program chief resident and chief resident in the UCLA Anxiety Disorders Clinic, subsequently joining the department as a faculty member in the Division of Adult Psychiatry at UCLA, and becoming an assistant professor in residence. In 2015, Dr. Khalsa joined LIBR as the Director of Clinical Studies, and as assistant professor (tenure track) at the University of Tulsa.

Dr. Khalsa’s research investigates how people perceive their heartbeat and overall body image, how the human brain maps cardiac sensation, and whether there is dysfunctional cross talk between the heart and brain in psychiatric and cardiovascular illnesses. To address these questions, his studies have examined the effects of aging, focal brain injury, cardiac dysfunction and medication practice on awareness of the heartbeat. Current projects examine the neural basis of heart-brain communication in anorexia nervosa and anxiety disorders, the effect of a novel drug on targeting brain function, the utility of a new mobile measure of body image perception in eating disorders, and the potential impact of floatation therapy on body image disturbance and anxiety in anorexia nervosa. These studies aim to ultimately answer the question: “How can we develop new tests and treatments that re-establish a functional dialogue between the body and brain?”

Dr. Khalsa’s clinical expertise focuses on the assessment and treatment of anxiety disorders. Dr. Khalsa previously served as associate director of the UCLA Anxiety Disorders Clinic, supervising resident physicians in the treatment of anxiety disorders, and was an attending psychiatrist in the UCLA OCD Intensive Outpatient Program. As founding Director of the Healthy Hearts Behavioral Medicine Program, an interdisciplinary endeavor started with the UCLA Cardiac Arrhythmia Center, he specialized in treating anxiety and mood disorders in individuals with cardiac arrhythmias. Current clinical activities include conducting case conferences with the Laureate Psychiatric Hospital and Clinic and psychoeducation groups with inpatients from the Laureate Eating Disorders Program.

Dr. Khalsa’s laboratory studies the heart-brain connection. His research explores three main questions:

1. How do we perceive our heartbeat?
2. Is there dysfunctional cross talk between the heart and brain in psychiatric and cardiovascular illnesses?
3. How can we develop new treatments that re-establish a functional dialogue between the body and brain?

RESEARCH COLLABORATORS

Okanjo Ajijola, M.D., Ph.D. - Medical Director
Armytyn Amavasai, M.D., Ph.D. - University of California - Los Angeles
Karl-Argro Biž, M.D. - University of Ljubljana
Jamie Feusner, M.D. - University of California – Los Angeles
Ronne Hurlemann, M.D., Ph.D. - University of California - Los Angeles
Mike Keller, Ph.D. - University of Tulsa
Richard Lane, M.D., Ph.D. - University of Arizona
Scott Menasce, M.D. - Medical Director, Laureate Eating Disorders Program

LAB MEMBERS

Katie Baker - Research Volunteer, University of Tulsa
Sheridan Chappelle, B.S. - Clinical Research Coordinator
Abigail Kimball - Research Volunteer, University of Tulsa
Christina Ralph-Nearman, Ph.D. - Postdoctoral Associate
Dhruvi Ravul - Research Volunteer, University of Tulsa
Chloe Sigman - Research Volunteer, University of Tulsa
Megan Simk - Research Volunteer, University of Tulsa
Adam Teed, Ph.D. - Postdoctoral Associate
Valerie Uphouse, R.N., B.S.N. - Clinical Research Coordinator

SELECTED PUBLICATIONS IN 2019:


Dr. Kirlic focuses on improving our understanding of the broad consequences of early life adversity, and which preventative interventions may mitigate the risk for psychiatric and medical illness in this population. His research explores these questions:

1. Can we identify adaptive versus maladaptive patterns of responses to early life adversity, and establish whether these predict resilience or vulnerability, respectively, over time?

2. By using novel preventative interventions, can we target the neurobiological and psychosocial systems disrupted by early life adversity, thereby improving short- and long-term outcomes?

Dr. Kirlic is currently funded by LIBR and the National Institute for General Medical Sciences (NIGMS).
Dr. Paulus’ research focuses on three main areas:

1. To use a neuroscience-based approach for:
   a. objective markers for psychiatric disorders
   b. better disease models
   c. better access to efficacious treatments
   d. brain-based and more effective interventions

2. To use computational approaches in order to move from one-size-fits-all toward precision psychiatry

3. To develop prevention strategies for psychiatric disorders

Dr. Paulus studied medicine at the Johannes Gutenberg University in Mainz from 1979-1985. He received a postdoctoral fellowship from the Deutsche Forschungsgemeinschaft (German Research Foundation) in 1986 to study the effects of calcium antagonists on animal models of mania at the University of California - San Diego (UCSD). In 1993, Dr. Paulus left UCSD to resume his medical training and completed his internship at the Long Island Jewish Medical Center/Zucker Hillside Hospital in Long Island, New York. In 1994, he rejoined the department of psychiatry at UCSD as a psychiatric resident. Dr. Paulus completed his residency in psychiatry in 1997. At that time, he joined the department of psychiatry at UCSD as an assistant professor and became a staff psychiatrist at the Veterans Affairs San Diego Health Care System (VASDHS). In May 2014, Dr. Paulus joined the Laureate Institute for Brain Research (LIBR) in Tulsa, Oklahoma, as the scientific director and president.

Dr. Paulus has published over 350 peer-reviewed publications (some in top tier journals like Science, Nature Reviews Neuroscience, PNAS, JAMA Psychiatry, Lancet Psychiatry, Biological Psychiatry, Neuronropsychopharmacology, and the American Journal of Psychiatry). Dr. Paulus received the UCSD Llew Judd Young Investigator Award, the NAMI Young Investigator Award, and the NIMH Outstanding Resident Award. He is the deputy editor of JAMA Psychiatry and is on several editorial boards of top-tier psychiatric journals. He has served on numerous NIH and International Study Sections. LIBR focuses on using neuroscience approaches to develop better assessments for diagnosis or prognosis of mental health problems, and to develop neuroscience-based novel interventions. Dr. Paulus’ research focuses on pragmatic academic psychiatry, i.e., how to use neuroscience-based measurements to identify modifiable treatment targets and to generate predictions that can be useful for clinicians. Moreover, Dr. Paulus is interested in whether computational approaches can be useful to better develop explanatory basis for psychiatric disorders that can be submitted to rigorous scientific examination.

**SCIENTIFIC BACKGROUND**

**SELECTED PUBLICATIONS**


**RESEARCH COLLABORATORS**

Gregory Brown, Ph.D.
University of California - San Diego
Michelle Crooks, Ph.D.
University of California - Los Angeles
Hugh Garavan Ph.D.
Professor of Psychiatry, Professor of Psychology, University of Vermont
Rita Z. Goldstein, Ph.D.
Johns School of Medicine at Mount Sinai
Paul Dawsonport, Ph.D.
University of Florida
Greg Foros, Ph.D.
Stanford University
Walter Kays, M.D.
University of California - San Diego
Rajita Sinha, Ph.D.
University of California - San Diego
Susan F. Tapert, Ph.D.
University of California - San Diego
Douglas Steele, M.D.
University of California- San Diego
Michelle Crooks, Ph.D.
University of California- San Diego

**LAB MEMBERS**

Kaiping Burrows, Ph.D.
Staff Scientist

Katie Forthman
Graduate Student

Hamed Elokhani, M.D., Ph.D.
Associate Investigator

Rayne Kuplicki, M.D.
Lead, Data Analyst

Mali Moradi, Ph.D.
Postdoctoral Fellow

Ryan Smith, Ph.D.
Associate Investigator

James Tidtthing
Research Assistant

Teresa Vitor, Ph.D.
Staff Scientist

Bohan Xu
Researcher

**SCIENTIFIC BACKGROUND**

**SELECTED PUBLICATIONS**


**RESEARCH COLLABORATORS**

Gregory Brown, Ph.D.
University of California - San Diego
Michelle Crooks, Ph.D.
University of California - Los Angeles
Hugh Garavan Ph.D.
Professor of Psychiatry, Professor of Psychology, University of Vermont
Rita Z. Goldstein, Ph.D.
Johns School of Medicine at Mount Sinai
Paul Dawsonport, Ph.D.
University of Florida
Greg Foros, Ph.D.
Stanford University
Walter Kays, M.D.
University of California - San Diego
Rajita Sinha, Ph.D.
University of California - San Diego
Susan F. Tapert, Ph.D.
University of California - San Diego
Douglas Steele, M.D.
University of California- San Diego
Michelle Crooks, Ph.D.
University of California- San Diego

**LAB MEMBERS**

Kaiping Burrows, Ph.D.
Staff Scientist

Katie Forthman
Graduate Student

Hamed Elokhani, M.D., Ph.D.
Associate Investigator

Rayne Kuplicki, M.D.
Lead, Data Analyst

Mali Moradi, Ph.D.
Postdoctoral Fellow

Ryan Smith, Ph.D.
Associate Investigator

James Tidtthing
Research Assistant

Teresa Vitor, Ph.D.
Staff Scientist

Bohan Xu
Researcher
Dr. Savitz’s work focuses on three main areas:

1. Just as a cardiac stress test can be used to identify abnormalities of the heart that are not visible at rest, so to can “stressing” the immune system enable us to detect hidden factors that may lead to maladaptive immune responses. We use low-dose endotoxin, part of the cell wall of gram-negative bacteria, to “trick” the immune system into launching a transient inflammatory response. To our knowledge, we are the first group in the world to perform an endotoxin challenge on depressed volunteers. Knowledge gained from this study will help us understand the mechanisms through which an inflammatory stimulus alters brain activity in a way that makes some people vulnerable to developing depression in the setting of inflammation.

2. Herpesviruses in healthy adults were traditionally considered to be harmless but there is emerging evidence that these viruses may not be completely benign. Herpesviruses lie dormant until they are reactivated and may set off an excess of neurotoxic kynurenines is produced. These metabolites damage neuronal cells and impair synaptic plasticity (changes in the junctions between neurons that allow them to communicate). Real time neurofeedback of the amygdala is a promising treatment for depression that likely works in part by altering synaptic plasticity. This study tests whether people with higher levels of neurotoxic kynurenine metabolites will be less likely to respond to neurofeedback. The research may help us develop a blood biomarker to should receive this type of treatment.

3. The balance of kynurenine pathway metabolism has been shown to be altered in depression, such that an excess of neurotoxic kynurenine is produced. These metabolites damage neuronal cells and impair synaptic plasticity (changes in the junctions between neurons that allow them to communicate). Real time neurofeedback of the amygdala is a promising treatment for depression that likely works in part by altering the connections between neuronal cells. This study tests whether people with higher levels of neurotoxic kynurenine metabolites will be less likely to respond to neurofeedback. The research may help us develop a blood biomarker that should receive this type of treatment.

SELECTED PUBLICATIONS


Michawar, N. and Savitz, J. (2016). Neurophysiology of Mood Disorders: Do we see the stigmata of inflammation? Translational Psychiatry. 6, e946.


Michawar, N. and Savitz, J. (2016). Neurophysiology of Mood Disorders: Do we see the stigmata of inflammation? Translational Psychiatry. 6, e946.


Dr. Smith received his bachelor’s degree in psychology from Arizona State University in 2010. He subsequently completed three graduate degrees from the University of Arizona between 2011 and 2015: master’s degrees in neuroscience and philosophy (with a focus on the philosophy of science and mind), and a Ph.D. in psychology (with a focus in cognitive neuroscience). His graduate work in philosophy focused on the relationship between scientific explanation and understanding, and on the relationship between physical and mental processes. This work was done primarily under the supervision of Jerann Ismail, who is a recognized leader in the philosophy of cognitive science and the philosophy of physics. Dr. Smith’s graduate work in neuroscience/psychology focused on the role of the prefrontal cortex in emotion and its pathology in major depression, using both structural and functional neuroimaging as well as measurement of heart-rate variability. This work was done primarily under the supervision of Dr. Richard Lane, who is both a practicing psychiatrist and a recognized pioneer in studying the brain basis of emotion.

Dr. Smith completed a three-year postdoctoral fellowship with Dr. W.D. Scott Killgore in the University of Arizona College of Medicine psychiatry department. During this fellowship, he designed and ran a neuroimaging study focused on understanding the ability to hold emotional information within working memory. He also played a primary role in creating an online emotional intelligence training program designed to minimize the development of emotional disorders in military personnel.

Upon completing this postdoctoral fellowship, Dr. Smith accepted an associate investigator position at LIBR, following completion of a four-month visiting fellowship with Dr. Karl Friston at University College London. This fellowship focused on designing computational models of brain function for use in understanding emotions and mechanisms underlying psychopathology.

Dr. Smith has authored more than 50 publications within peer-reviewed journals and scholarly books, based in part on the work described above. Many of these publications have also made theoretical contributions, proposing neurocognitive and computational models of conscious/unconscious emotion, neurovisceral integration, emotional intelligence, and depression.

**SELECTED PUBLICATIONS**


**RESEARCH COLLABORATORS**

Je Cho, M.D., Ph.D.
University of California - Los Angeles

Karl Killgore, M.B.B.S., MBPsych
University College London

Rex Ross, M.D.
McGill University

Jessa Hoy, Ph.D.
University of Wyoming

Julian Thayer, Ph.D.
The Ohio State University

Karin Wehr, M.D.
University of Arizona

Thomas Parr, Ph.D.
University College London

Casper Hoy, M.S.
University of Hamburg

Paul Badcock, Ph.D.
University of Melbourne

Richard Lane, M.D., Ph.D.
University of Arizona

Michael Mautonsson, Ph.D., M.B.B.S.
University College London

Guenther Hoy, M.D.
University of Cambridge

Julian Koenig, Ph.D.
Heidelberg University

Jin Cho, M.D., Ph.D.
University College London

Michal Alex, Ph.D.
University of Iowa

**SCIENTIFIC BACKGROUND**

Dr. Smith’s main research interests include understanding how conscious and unconscious emotion-related processes are realized within the brain, and how these processes may be altered in mood and anxiety disorders. Dr. Smith’s primary research methods are neuroimaging and computational modeling.

A major focus of his work is characterizing differences between mentally healthy and unhealthy individuals, with the goal of improving diagnosis and treatment selection within psychiatry and clinical psychology.

**RESEARCH PROGRAM HIGHLIGHTS**

**Main Questions**

How does the brain generate emotions, and how do we subsequently recognize and become aware of our own emotions? Can these processes be understood in terms of the computational processes performed by the brain? How might these computational processes be affected in psychiatric disorders? Could understanding these mechanisms improve treatment?

**Approach**

We employ several methods aimed at providing multiple levels of description in characterizing emotion-related psychological and biological processes, including self-reported experience, behavioral and physiological responses, functional neuroimaging, and computational modeling.

**Future Directions**

We aim to establish (1) the role of conscious and unconscious emotional processes in psychiatric disorders at a cognitive, computational, and neurobiological level of description; (2) how such processes contribute to the vulnerability to—and the onset and maintenance of—psychiatric symptoms; and (3) how characterizing such processes in individual participants might inform more individualized and targeted treatment selection.
Dr. Stewart employs subjective reports (questionnaires and clinical interviews), behavioral methods, electroencephalography (EEG), event-related potential (ERP) and functional magnetic resonance imaging (fMRI) to investigate how brain patterns linked to cognition, emotion and their interaction intersect with individual differences in substance use, depression and anxiety disorders. People who are suffering from drug addictions, depression and/or anxiety often have difficulties processing emotions and making decisions that are evident in patterns of brain activity and behavior.

Dr. Stewart’s primary research areas include:

1. Can we identify brain/behavioral markers of risk for future addiction in young adults who have not yet transitioned to chronic mental health problems?
2. In individuals experiencing chronic addiction, can we identify brain/behavioral markers of short-term and long-term abstinence and recovery?
3. Once viable brain/behavioral markers are identified, these can be used in clinical prevention and early intervention efforts.

SELECTED PUBLICATIONS (2016-Present)


RESEARCH COLLABORATORS

John J.B. Allen, Ph.D.
University of Arizona

Robin L. Aupperle, Ph.D.
Laureate Institute for Brain Research

April C. May, M.A.
University of California—San Diego

Martin P. Paulus, M.D.
Laureate Institute for Brain Research

Dr. Stewart earned a B.S. in psychology from University of California – San Diego (UCSD) in 1998, where she worked with Dr. Brett Clementz on EEG and eye-tracking studies of schizophrenia and bipolar disorder. Following further EEG and ERP training with Dr. John Polich at the Scripps Research Institute, Dr. Stewart completed her M.A. (2005) and Ph.D. (2008) in clinical psychology at the University of Illinois at Urbana-Champaign working with Drs. Greg Miller and Wendy Heller. Her graduate work used EEG, ERP and fMRI methods to investigate patterns of functional brain asymmetry as a function of approach- versus withdrawal-related anger expression styles (anger-out versus anger-in), taking patterns of comorbid depression and anxiety into account. In her postdoctoral studies, Dr. Stewart evaluated the viability of brain asymmetry as a biomarker of depression risk with Dr. John Allen at the University of Arizona and investigated potential markers of stimulant addiction risk and relapse with Dr. Martin Paulus at UCSD.

Starting in 2014, Dr. Stewart spent four years as an assistant professor of clinical psychology at the City University of New York (CUNY Queens College/The Graduate Center) where she served as training area coordinator for their APA-accredited clinical program. While at CUNY, she supervised undergraduate and graduate students on EEG/ERP data collection/analysis for studies evaluating biomarkers of depression risk and heavy marijuana use in college students. She taught courses on psychopathology, introduction to clinical psychology, multivariate statistics, clinical interviewing and neuropsychological assessment.

In the past decade, Dr. Stewart has assisted in mentoring and training undergraduates, graduate students, postdoctoral researchers and visiting scientists on clinical assessment measures as well as EEG, ERP and fMRI methodology, data collection/analysis, manuscript writing, talks, poster presentations and grant applications. She is enthusiastic about science and hopes to empower students with the tools to become successful researchers. Dr. Stewart joined LIBR in July 2018.
Ongoing Studies

If you are interested in participating in any of the studies below, or would like to be considered for future studies, please call our assessment team at 918-502-5100 or email info@laureateinstitute.org.

FLOAT STUDY

Do these statements describe you?

- Have pre-existing mood conditions
- Have taken any kind of psychiatric medication in the past
- Have unrelenting and incapacitating worry
- Are experiencing moderate to severe depression
- Are experiencing high anxiety
- Have experienced a head injury
- Have been diagnosed with PTSD
- Have a family history of mental illness
- Have been a volunteer in a research study before
- Are interested in contributing to the scientific understanding of brain disorders

If you "feel" at the time of the item above, then you may qualify for a Float Therapy Study at the Laureate Institute for Brain Research (LIBR).

We are currently recruiting 25 participants for this study. The recruitment target may be revised as necessary.

We are also recruiting for a Float Therapy Study that may begin in the near future.

Contact info@laureateinstitute.org or call 918-502-5100 for more information.

JOIN A TEEN STUDY

ABOUT OUR RESEARCH

Teenagers are uniquely vulnerable to mental health problems that can lead to depression, anxiety, and other psychiatric disorders. Adolescents in our studies will be given the opportunity to participate in cutting-edge research to help us better understand the causes of these conditions.

STUDY PARTICIPATION

We are looking for participants who are 12-18 years old and who have experienced symptoms of depression or anxiety. Participants will be given a thorough evaluation to determine their eligibility.

WE NEED YOU

Participants will be compensated for their time and effort. This could include gift cards, cash, or other incentives. The specific compensation will be discussed during the initial evaluation.

PARTICIPATION

Participants will be asked to complete a variety of assessments that may include questionnaires, interviews, and/or physical exams. The study duration will vary depending on the participant’s needs.

STUDY LOCATIONS

The study will take place at the Laureate Institute for Brain Research (LIBR) in Tulsa, OK. Participants will be reimbursed for travel expenses.

For more information, call 918-502-5142 or email info@laureateinstitute.org.
**2019 PUBLICATIONS**

**Neuroimage.** 2019 Nov 15;202:116091.