Duke Institute for Brain Sciences
Annual Report
July 1, 2018–June 30, 2019
Duke Institute for Brain Sciences Annual Report
July 1, 2018 – June 30, 2019

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Executive Summary

This has been an exciting year of continued growth, new ideas, and implementation of goals derived from our strategic plan, ensuring they aligned with the goals set forth by Duke’s President Vincent Price, to “Innovate, Incubate, and Include.”

This report captures DIBS initiatives and activities focused on four strategic priorities: catalyzing collaborative research, providing exceptional interdisciplinary education, building brain science bridges across Duke, and engaging and inspiring campus and community stakeholders.

Supporting Innovative Research Collaborations

The DIBS Faculty Network has now grown to nearly 200. Many of these faculty members have been involved in our seed-grant funding programs: Incubator Awards and Germinator Awards. These high-risk/high-return awards support exploratory research that provides the groundwork for external funding. In 2018–2019, the Institute:

- Funded six Incubator Awards of $100,000 each, with team members from 10 departments in three schools.
- Announced the seven inaugural Germinator Awards of $25,000 each. Recipients represented 10 departments and programs across campus, as well as the Durham Veterans Administration Health Care System.
- Identified significant follow-on activities resulting from Incubator Award funding, 2013–2018, including a 7:1 return on investment, more than 50 peer-reviewed publications, and extensive student and trainee involvement.

Providing Exceptional Neuroscience Education

DIBS offers outstanding education and programming for undergraduates, graduate students, and postdoctoral associates. Over the past year, the Institute:

- Supported undergraduate neuroscience students through the Summer Neuroscience Program, an 8-week program involving professional development seminars and opportunities to be mentored by faculty and conduct research in Duke neuroscience labs.
- Oversaw the Bass Connections Brain & Society Theme, with 14 student/faculty teams exploring real-world problems related to neuroscience, human behavior, and mental health.
- Expanded the membership and programs of the Graduate Student and Postdoctoral Consortia, with a focus on career development and collaboration. One new postdoctoral program, PARTNeR, connects neuroscience postdocs and medical resident physicians who share an interest in brain function and mental health.
- Offered the Cognitive Neuroscience Admitting Program, which allows...
neuroscience graduate students to participate in an interdisciplinary educational experience involving multiple departments and faculty; and the **Annual Neuroscience Bootcamp**, a two-week immersive classroom and lab experience for CNAP and other graduate students.

**BUILDING BRAIN SCIENCE BRIDGES ACROSS DUKE**

The Duke Institute for Brain Sciences serves a vital role in creating and nurturing relationships among faculty, students, and staff across campus. This year, the Institute supported more than 230 events attracting 3,600 faculty, students, trainees, and staff. Highlights included:

- Hosting the **DIBS Distinguished Lecture & Symposium**, with Joshua Gordon, MD, PhD, Director of the National Institute for Mental Health, as keynote speaker. “From Brain Circuits to Behavior: How Technology is Transforming the Science of Mental Health” also featured presentations by Duke faculty and a poster session.

Dr. Dawson’s appointment was announced jointly by Duke Provost Sally Kornbluth and School of Medicine Dean Mary Klotman. An internationally renowned scientist and clinician, they noted, “Dr. Dawson has a long track record of inspiring and effective institutional leadership and deep knowledge of the DIBS community.”

Three Associate Directors will serve as part of the DIBS leadership team: Nicole Schramm-Sapyta, PhD, previously DIBS Chief Operating Officer; Alison Adcock, MD, PhD, Director of the DIBS Center for Cognitive Neuroscience; and Leonard White, PhD, previously DIBS Director for Education. Dr. Dawson will continue to lead the Duke Center for Autism and Brain Development.

“I am honored and excited to take on this leadership role at DIBS,” said Dr. Dawson. “I am eager to work with the exceptional DIBS faculty, students, and staff as we continue to promote innovation in neuroscience research, outstanding education, and meaningful engagement with our community.”

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—Geraldine Dawson, PhD

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**“I’m at Duke for their @DukeBrain [symposium], @elena811 of @GeriDawson group [Duke Autism Center] presenting poster on early autism. Found that verbalizations captured by smartphones during screening predict later autism dx [diagnosis]”**

—Tweet from Dr. Joshua Gordon, @NIMH Director, with Postdoctoral Associate Elena Tenebaum, PhD
Expanding interactive programs addressing "Inclusion and Power Dynamics in the Research Environment." More than 200 faculty, students, and staff participated in a series of interactive workshops on topics ranging from workplace misconduct and difficult conversations to serving as an effective ally. The series also featured a seminar on "Understanding the Neuroscience of Implicit Bias" by Damian Stanley, PhD, from Adelphi University. Most sessions had waiting lists, and post-session surveys indicated a significant improvement in attendees' understanding of these issues.

Facilitating regular symposia, colloquia, seminars, and other activities for the DIBS Research Centers:
- Center for Cognitive Neuroscience
- Center on Addiction and Behavior Change
- Duke Center for Autism and Brain Development
- Duke Center for Interdisciplinary Decision Science
- Center for Neural Engineering and Neurotechnology

Assisting DIBS Research Groups with new member recruitment, meetings and retreats:
- Computational & Theoretical Neuroscience Research Group (new this year)
- Cognitive, Auditory & Neural Bases of Language & Speech Group
- Neurohumanities Research Group
- Neuroimmunology & Glia Group

Organizing interdisciplinary events designed to attract faculty, graduate students, and postdoctoral associates from across campus:
- CCN's inaugural Smokies Cognition and Neuroscience Symposium, in Asheville, for researchers from Duke, Emory University, Georgia Institute for Technology, University of North Carolina at Chapel Hill, and Vanderbilt University
- CABC's annual symposium, "Altered States of Cannabis Regulation: Informing Policy with Science," co-sponsored by Duke CIPHERS program (Cannabis-Induced Potential Heritability of Epigenetic Revisions in Sperm), and the John Templeton Foundation

ENGAGING WITH COMMUNITY STAKEHOLDERS

The Institute supports many activities to promote and encourage interaction among campus stakeholders, including:

- **Art and the brain.** In February 2019, DIBS partnered with Neurobiology for a special event at UNC's Ackland Art Museum to view the exhibit, "The Beautiful Brain: The Drawings of Santiago Ramón y Cajal." More than 300 attended.

DIBS Faculty Network Member Diego Bohórquez, PhD, and his son enjoy 'The Beautiful Brain: The Drawings of Santiago Ramón y Cajal'.

The Institute's community activities engage hundreds of adults and children, both at "The Cube" and at other sites in the Triangle, including:

- **DIBS Discovery Day.** DIBS hosted a record-breaking crowd of 565 this year. Kids enjoyed touching a brain and coloring, while adults browsed exhibits designed by Bass Connections students, graduate students, and postdocs. This year, with assistance from co-sponsor Duke Center for Autism and Brain Development, a sensory-friendly hour held before the event's official start attracted 75 people.
**Autism Awareness Month.** DIBS partnered with the Duke Center for Autism and Brain Development to host the Honourable Mike Lake, member of Canadian Parliament and autism advocate. He was joined by his son, Jaden, who is on the autism spectrum. In his presentation, “Expect More: An Autism Adventure,” Lake emphasized the value of neurodiversity in our society and personal relationships.
Supporting Innovative Research Collaborations

DIBS has a Faculty Network of nearly 200 researchers, representing several dozen departments in the Schools of Medicine, Engineering, Law, and Trinity College of Arts & Sciences. DIBS invests in early-stage research projects to encourage interdisciplinary collaboration, promote testing of new ideas, increase the likelihood of obtaining external research funding, and help train the next generation of research scientists.

“These high-risk/high reward projects encourage new interdisciplinary collaborations and allow researchers at Duke to take risks and pursue cutting edge science.”

-Geraldine Dawson, PhD  
Director, Duke Institute for Brain Sciences

DIBS nurtures novel ideas for interdisciplinary research through two seed-grant funding programs. These high-risk/high-return funding mechanisms provide support for research that is exploratory and therefore not yet ready for external funding. To be successful, they must catalyze new research or collaboration and enhance chances of obtaining external funding.

• **Research Incubator Awards** provide up to $100,000 and require a minimum of two faculty members from different disciplines.

• **Research Germinator Awards**, new for 2018-2019, support smaller, targeted requests up to $25,000 and may go to single investigators, including students and postdoctoral associates.

2018–2019 Research Incubator Awards

DIBS Research Incubator Awards fund projects that represent exceptional innovation and broad significance to the field of neuroscience. For 2018-2019, six interdisciplinary Duke faculty teams were selected to receive Incubator Awards, with each team receiving $100,000. The teams represent 10 departments in three schools.

Incubator Project Synopses

**Understanding and Changing Brain States through Real-time Neural Activity Analysis**  
*PI*: John Pearson, PhD, Biostatistics & Bioinformatics; Eva Amaible Nauman, PhD, Neurobiology. Both are affiliated with the School of Medicine.

One of the great neuroscience challenges is to understand how local groups of cells work together in circuits to generate complex behaviors. Scientists had been limited to studying only a few of these cells at a time, but new developments in microscope and imaging technology make it possible to study much larger groups of cells. But there’s a downside: These studies can generate a huge amount of data—up to a terabyte of data an hour, per experiment. The team’s goal is to remove much of this burden by using new data-processing methods and computer hardware to analyze the incoming brain signals in real time.
Finding Better Treatments for Depression (funded by the DIBS External Advisory Board, in memory of Julie Rhodes)

**PI:** Mike Tadross, MD, PhD, Biomedical Engineering, Pratt School of Engineering; Kafui Dzirasa, MD, PhD, Psychiatry & Behavioral Sciences, School of Medicine

Major depressive disorder is the leading cause of disability in the world. Drug treatments available fail to adequately treat the disorder in up to 50 percent of patients. Recent evidence indicates that ketamine, a drug with anesthetic and pain-killing properties, can effectively treat symptoms in this population. However, ketamine has many side effects that limit its broad clinical utility. This study uses groundbreaking technologies to uncover the mechanisms underlying ketamine’s antidepressant effects. Successful completion of this work will yield a multi-scale understanding of depression, providing insight into how a precise pharmacological intervention, targeted to specific cells in the brain, propagates to affect whole-brain dynamics and behavior. The work has the potential to yield a new class of precision therapeutics to rapidly reverse depressive symptoms in a broad patient population.

“For me, DIBS has been a source of both financial support and scientific inspiration as I and colleagues from different areas of campus seek a better understanding of the brain mechanisms of depression.”

–Kafui Dzirasa, MD, PhD
Psychiatry & Behavioral Sciences
Harnessing Sleep/Circadian Rhythm Data as a Biomarker to Mitigate Health Risks

PI: Jessica R. Lunsford-Avery, PhD, Psychiatry & Behavioral Sciences, School of Medicine; Matthew Engelhard, MD, PhD, Psychiatry & Behavioral Sciences and Electrical & Computer Engineering, Pratt School of Engineering; Scott Kollins, PhD, Psychiatry & Behavioral Sciences; Ricardo Henao, PhD, Biostatistics & Bioinformatics, School of Medicine, and Electrical & Computer Engineering, Pratt School of Engineering; Sujay Kansagra, MD, Pediatrics, School of Medicine

We know sleep is essential to maintaining good health, but physicians often do not identify sleep problems during routine patient visits. As a result, the problems are not sufficiently addressed. One obstacle to measuring sleep is its complexity. Key factors include an individual's daily rest and activity rhythms, the length and quality of sleep, time spent in sleep stages (e.g., deep sleep versus rapid eye movement sleep), and behaviors, such as maintaining a consistent bedtime. This project aims to better understand the specific patterns of sleep that place people at risk for—or protect them from—health problems. The investigators also hope to develop more feasible ways of assessing sleep. Traditional ways of identifying sleep problems, such as spending the night in a sleep clinic, are often expensive or unavailable. This study uses wearable sleep monitors worn at home to identify sleep patterns that increase health risks.

Our Sense of Touch and Its Role in Chronic Pain

PI: Jörg Grandl, PhD, Neurobiology, School of Medicine; Stefan Zauscher, PhD, Mechanical Engineering & Materials Science, Pratt School of Engineering

The sense of touch is crucial for our survival, and its malfunction is associated with inflammatory pain and chronic pain, for which medical treatments remain inadequate. Researchers are investigating how nerve cells are specialized to sense touch by developing a detailed classification of nerve cells, using new technology. The team is testing a unique instrument to measure the electrical activity of nerve cells in response to a clearly defined stimulus, then using the instrument to characterize hundreds of nerve cells to reveal exactly how they are specialized to sense touch. This knowledge will enable us to understand how the electrical response of neurons is changed in chronic disabling conditions, such as inflammatory pain.

“The Incubator grant provided valuable funding to develop the new tool we are using to study proteins activated in response to mechanical force.” (Please see image below.)

–Michael Young, Graduate Student
Early Language Development in the Visually Impaired

*Pl: Elika Bergelson, PhD, Psychology & Neuroscience, Trinity College of Arts & Sciences (A&S); Marty Woldorff, PhD, Psychiatry & Behavioral Sciences, School of Medicine, and Psychology & Neuroscience, A&S; Sharon Freedman, MD, Professor of Ophthalmology and Pediatrics, School of Medicine*

Children with hearing loss who receive late intervention usually have poor language outcomes, but children with vision loss generally attain typical language abilities. Blind adults and older children have largely indistinguishable language abilities from sighted individuals. Early language abilities in young blind children have not been studied extensively. This is significant, given that vision loss affects >75,000 children under age 4 in the U.S. One major roadblock to understanding early language abilities in blind children is that most tests rely on eye-tracking measures, which are not possible in blind infants. For this group, the team is using auditory-based electroencephalography (EEG) paradigms well-established with infants and toddlers. Uncovering how blind children learn and represent words will reveal how sensory impairment shapes the developing brain, which in turn will inform our understanding of cognition and language.

Smelling Sulfur in Wilson’s Disease: How Does Copper Metabolism Affect Olfaction?

*Pl: Hiroaki Matsunami, PhD, Molecular Genetics & Microbiology; Dennis Thiele, PhD, Pharmacology & Cancer Biology; Kevin Franks, PhD, Neurobiology. All are affiliated with the School of Medicine.*

Wilson’s disease is caused by mutations in the copper transporter gene ATP7A, resulting in toxic accumulation of copper in various organs and leading to liver and kidney damage and various neurological problems, among other complications. One curious attribute of patients with Wilson’s disease: They seem to be indifferent to sulfur-containing odors such as flatulence and natural gas additive, suggesting a link between copper metabolism and olfaction. By studying this copper-dependent olfactory defect, the team hopes to validate a novel mechanism underlying the fundamental biology of smell, which could lead to an innovative, non-invasive way to identify Wilson’s disease, enabling early interventions to reduce irreversible brain damage.

6th Award Honors Memory of Julie Rhodes

For the second year, the DIBS External Advisory Board members voted to fund an award in addition to the five already supported by the Institute’s funding. This year’s Board’s gift honors the memory of Julie Rhodes, the first DIBS Director of Communications.

A talented graphic designer and communicator, Rhodes was instrumental in the planning and opening of the DIBS “Cube” and underground space. She died August 17, 2018. The Board selected the project led by investigators Kafui Dzirasa, MD, PhD, Psychiatry & Behavioral Sciences, and Mike Tadross, MD, PhD, Biomedical Engineering and Neurobiology, who seek new therapeutic approaches to treating depression, to honor Rhodes. *(Please see more information about the project on Page 9.)*

“We are very grateful to the Board members for their contributions to this valuable program, and for honoring Julie Rhodes, who was an extraordinary contributor to the success of the Institute.”

–Nicole Schramm-Sapyta, PhD
Anne West, MD, PhD, Associate Professor of Neurobiology, and DIBS Faculty Network Member, studies molecular/cellular aspects of neurons. She and her colleagues have received two Research Incubator Awards. The awards, she said, “are ideal for starting or generating projects that are too exploratory for the National Institutes of Health or other granting agencies.” She discussed the impact of Incubator funding on her research program during the April 2019 meeting of the DIBS External Advisory Board.

In 2012, very little was known about the role of DNA structure in the formation of neuronal cells, and studying the cells required specialized techniques. To overcome this limitation, West brought together an interdisciplinary group of investigators to leverage the collective expertise of a neuronal cell biologist, a genome biologist, and a computational biologist.

Scientists now understand that during normal brain development, genes are turned on or off to let each specialized cell develop its unique function. By contrast, aberrant regulation of the genome during development frequently leads to childhood cancers. Among these cancers is medulloblastoma, the most common and often deadly brain tumor in infants and young children. Researchers have identified changes in gene-expression regulation in medulloblastoma that may explain why normal brain cells become tumors in this disease. West and her colleagues are working toward a mouse model that could allow testing of new ways to treat medulloblastoma.

These studies also are providing important new insights into a fundamental molecular process of brain development that has importance for understanding brain tumors.

West emphasized that her DIBS Incubator Award was critical for jump-starting this line of research and ultimately receiving funding from the NIH. “I have sat on NIH grant review committees, so I know one year’s worth of funding to collect pilot data will make a real difference,” she said. The Incubator Awards also are important to education and training. “They help make it possible to train the next generation of scientists,” she added.

“The Incubator Awards help make it possible to train the next generation of scientists.”

—Anne West, MD, PhD
2018–2019 Germinator Research Awards

Germinator awards ($25,000 for one year) are ideal for smaller projects, a piece of critical equipment, or personnel that are needed to bring a new idea or collaboration to fruition. Seven projects involving nearly two dozen Duke clinical and basic-science faculty and students received the first Germinator Research Awards. They represent 10 departments and programs within three schools: Medicine, Pratt School of Engineering, and Trinity College of Arts & Sciences, as well as the Durham Veterans Administration Health Care System. Following are the title and synopsis of each project.

Germinator Project Synopses

**Targeting the Emotional Region of the Brain to Help those with Post-Traumatic Stress Disorder**

*Lysianne Beynel, PhD, Nathan Kimbrel, PhD, Greg Appelbaum, PhD, Psychiatry & Behavioral Sciences; Simon Davis, PhD, Neurology*

Post-traumatic stress disorder (PTSD) can be highly debilitating and difficult to treat. Transcranial magnetic stimulation (rTMS), which uses magnetic fields to affect the brain, has demonstrated only modest efficacy in helping reduce the symptoms of PTSD. This team is working on improving the therapeutic efficacy of rTMS through novel methods that can influence the activity of the amygdala, a brain region involved in emotions, survival instincts, and memory, through its connections to other brain regions. The project involves the Duke School of Medicine and the Durham VA Health Care System.

**Using Machine-Learning and Data Science to Understand Psychiatric Illness**

*Christina Bejjani and Tobias Egner, PhD, Psychology & Neuroscience (P&N); John Pearson, PhD, Biostatistics & Bioinformatics; Terrie Moffitt, PhD, P&N, Psychiatry & Behavioral Sciences, Center for Genomic & Computational Biology (CGCB); Social Behaviour & Development, King’s College, London; Avshalom Caspi, PhD, P&N, Psychiatry & Behavioral Sciences, CGCB;*
Social Behaviour & Development, King’s College; and R. Alison Adcock, MD, PhD, P&N, Psychiatry & Behavioral Sciences

This research project brings together the fields of psychiatry, developmental psychology, machine learning, biostatistics, cognitive psychology, and neuroscience with a goal of improving diagnosis and treatment of psychiatric disorders. The team uses computational psychiatry, a relatively new field that uses data science to study mental conditions, to develop more effective methods of diagnosis of psychiatric illness.

How the Lemur Can Help Us Understand the Brain Regions Involved in Social Bonding
Nicholas Grebe, PhD, and Christine Drea, PhD, Evolutionary Anthropology

Among closely related primate groups of the genus Eulemur, some male and female lemurs form monogamous pair bonds, while others mate with multiple partners. This unique behavior may be related to the mammalian neuropeptide oxytocin, which facilitates social bonding. This project compares the neuroendocrinology of different patterns of pair-bonding in Eulemur, which can provide significant insights on how this neuropeptide works. This non-invasive research represents a new program of lemur brain science with potential implications for human behavior.

The Neural Basis of Regulating Emotions
Kevin LaBar, PhD, Psychology & Neuroscience (P&N); Simon Davis, PhD, Neurology; Andrada Neacsiu, PhD, Psychiatry & Behavioral Sciences; John Powers, P&N

Emotion regulation is a core component of therapeutic approaches to alleviate distress associated with psychiatric disorders. Distancing is an emotion-regulation strategy that relies on the ability to shift perspective from the here and now to a distant time, place, or person. The team is using transcranial magnetic stimulation in adults to understand the brain processes that allow people to regulate their emotions through distancing.

Virally Mediated Transduction of Light-Sensitive Ion Channels in Brainstem Motoneurons of Macaques
Marc A. Sommer, PhD, and Martin O. Bohlen, PhD, Biomedical Engineering

How do our nerve cells drive muscle activity? An answer to this question could lead to treatments for people with neuromuscular diseases, such as multiple...
More than 1,500 service members have lost limbs in the wars in Iraq and Afghanistan since 2001. DIBS-funded research involving Duke and the Durham VA seeks to improve rehabilitation and pain control. (Photo courtesy of Health.mil, Military Health System website.)

sclerosis. This project applies optogenetics, a way to control neurons by using light, to the study of muscle activity in non-human primates, with a goal of understanding how nerve cells drive muscle activity.

Restoring Tactile Sensation & Proprioception in Lower-limb Amputees Using Epidural Spinal Cord Stimulation

Amol Yadav, PhD, Muhammad Abd-El Barr, MD, PhD, and Nandan Lad, MD, PhD, Neurosurgery; Tim Sell, PhD, PT, Orthopedic Surgery; Paul Howell, MD, Durham VA Health Care System, Physical Medicine and Rehabilitation Services

Amputation of a lower limb hinders mobility significantly, affecting quality of life. Modern prosthetic leg technology helps, but cannot duplicate the ability of the human leg to relay vital sensory information to the brain about the body’s surroundings, nor can it address the often-intense “phantom pain” felt in missing limbs. A multidisciplinary team of experts from the School of Medicine and the Durham VA Health Care System is working with amputees using spinal-cord stimulation to generate missing sensory information, with the goals of improving rehabilitation and controlling phantom pain.
Providing Exceptional Neuroscience Education

DIBS facilitates neuroscience education for learners at all levels: undergraduates, graduate students, postdoctoral associates, and life-long learners. Our trainees are passionate about studying the brain and committed to making a difference by addressing real-world problems. By supporting interdisciplinary education and professional development, DIBS offers students and trainees the ability to gain a working knowledge of diverse disciplines, preparing them for meaningful careers in universities and academic medical centers, industry, government, and the nonprofit sector.

Undergraduate Neuroscience Education

The undergraduate Neuroscience major, part of the Department of Psychology & Neuroscience in the Trinity College of Arts & Sciences, is now in its 11th year. This undergraduate studies program includes management of BS and AB academic plans, as well as a minor and a certificate program in Decision Science.

DIBS supports the undergraduate neuroscience program in conjunction with the Department of Psychology & Neuroscience, and through the following activities:

Summer Neuroscience Program

Duke’s Summer Neuroscience Program is an 8-week summer program enabling undergraduates to conduct full-time research in the labs of Duke faculty to jump start their Graduation with Distinction senior theses. Full-time participants receive a $3,000 stipend; mentors receive $1,000 toward lab expenses. The program, which serves about 18 students each year, also includes weekly professional development seminars.

Connecting Students with Hands-on Research Opportunities

DIBS maintains a website listing neuroscience labs to connect interested students with research opportunities across the University and School of Medicine. The students use the site to identify and connect with potential faculty mentors, then conduct independent study and senior thesis projects under their guidance.

Bass Connections in Brain & Society

Bass Connections is a university-wide program that brings together Duke faculty and students to explore real-world issues in interdisciplinary research teams. DIBS oversees the Bass Connections Brain & Society theme, focused on problems of brain science, human behavior, and mental health.

“I am absolutely blown away every year by how bright, curious, and committed these undergrads are. The energy and enthusiasm of the group are incredible, and it’s always impressive to see how their research projects develop over the summer and the amazing discoveries they make!”

–Thomas Newpher, PhD
Summer Neuroscience Program Director
Assistant Professor of the Practice, Psychology & Neuroscience
Several Bass Connections teams are investigating ways to encourage exercise as a means to improve brain health, from using digital messaging to identifying what motivates individuals, including youngsters, to be active.

In 2018-2019, there were 14 Bass Connections Brain & Society teams involving faculty and dozens of learners at every level within the academic community:

- Cheating, Gaming & Rule Fixing: Challenges for Ethics across the Adversarial Professions
- Consumer EEG, Mental & Emotional States, Privacy & the Brain
- Emotional Connection: Developing a Mobile Intervention for Social & Emotional Dysfunction
- Evaluating Interventions Aimed at Improving Neurosurgical Patient Outcomes in Uganda
- Exercise & Mental Health
- Exercise Therapy & Brain Health: Implications for Alzheimer’s Disease & Aging
- Expressive Writing for Resilience in Adult Pediatric Oncology Survivors & Their Caregivers
- Moral Artificial Intelligence
- Oculomotor Response as an Objective Assessment for Mild TBI in the Pediatric Population
- Patients’ Journey to Medication Adherence
- Remember Why You Should Do It? Memory & Reasons in Moral Decision-making
- Transforming Alzheimer’s Disease Care through Integrating Caregivers
- Using Machine Learning to Generate Clinical Prediction Rules for Clinical Outcomes in Schizophrenia
- Using Neuroscience to Optimize Digital Health Interventions across Adulthood

Fascinated by the complexity of the human nervous system

Scientists have long been interested in how memories are shaped, encoded, and stored in the brain. Shreya Bhatia (T ’20, Neuroscience), a 2019 Summer Neuroscience Program participant, shares their interest—in part because of her work with Alzheimer’s disease patients in a dementia care center.

For her summer research, Bhatia, shown above, investigated the neural mechanisms by which sustained attention shapes memory formation. To do so, she used electroencephalography (EEG), which tracks electrical activity in the brain through small wires placed on the scalp. The wires then send the information to a computer, which records the results. She seeks to identify relationships between patterns of brain-wave activity and memory.

“I am fascinated by the complexity of the nervous system and plan to continue pursuing neuroscience after graduation through research or a career in medicine.”

–Shreya Bhatia (T ’20, Neuroscience)
The DIBS Cube—A ‘Home Base’ for Neuroscience Students

DIBS provides physical space to support Neuroscience undergraduates and to build community within Neuroscience and other academic programs. Undergraduate courses involving more than 200 students are held annually in DIBS classrooms, and our learning and social spaces remain an important asset to undergraduate students throughout the academic year. At the end of spring semester, DIBS honors Neuroscience students graduating with distinction with a community celebration and poster session showcasing their scientific achievements. This annual event attracts several hundred undergraduate and graduate students, postdocs, and faculty.

Bass Connections Team Seeks Better Tools to Diagnose Brain Injuries

Brain injuries in children are complex, common, and the leading source of injury and death. Sports-related concussions in children and adolescents (5-18 years) account for between 30 and 60 percent of all pediatric concussions. Mild Traumatic Brain Injury (mTBI) is an important public health issue for both the general pediatric population and youth athletes, but challenges exist in obtaining objective diagnoses of mTBI or quantifying the physiological implications of cumulative subconcussive (low-level) insults.

One promising diagnostic tool is assessment of eye movement, or oculomotor function. This Bass Connections team, “Oculomotor Response as an Objective Assessment for Mild TBI in the Pediatric Population,” in its fifth year, has been evaluating a sample of youth athletes from elementary to high school, with a goal of determining differences between concussed and non-concussed populations across multiple age levels and levels of play. Team faculty, students, and staff represent more than six different disciplines within the University and School of Medicine.

T-shirts, ice cream, and research posters are all part of the annual DIBS community celebration of Neuroscience students graduating with distinction.
Jill Jones, ’20, Neuroscience & Linguistics, Trinity College of Arts & Sciences

Jill Jones came to Duke interested in science, but had “no idea what it meant to work in a lab or actually do research.” She jumped in almost immediately, working in several different labs, but still hadn’t found a specific focus area. That changed in September 2017, when “something happened in my life that changed my research direction for good.”

A friend and fellow member of the Duke Jazz Ensemble died after a 15-year battle with neuroblastoma, a rare and aggressive form of childhood brain cancer. It was a tragic but transformative experience: “I realized the only way I could cope was by immersing myself in research on my friend’s disease,” she said.

One way was through a new Bass Connections Brain & Society Theme project, “Expressive Writing for Resilience in Adult Pediatric Oncology Survivors and Their Caregivers.” Another was to focus her research interests on pediatric brain tumors—the leading cause of cancer-related deaths in children—at the Duke Pediatric Brain Tumor Lab. Her research on another deadly brain cancer, medulloblastoma, has yielded several important findings, and she is eager to continue her work at and beyond Duke.

She credits “many, many brilliant minds” for her success, including DIBS faculty mentors such as Leonard White, PhD, who support student research. Without DIBS, she told the External Advisory Board in April, “I would never have had the experiences, built the relationships, and made the scientific progress I’ve made.”

“I hope to become a physician-scientist, earning an MD/PhD in Neuroscience after Duke and then working as both a principal investigator and practicing pediatric neuro-oncologist.”

–Jill Jones (T ’20, Neuroscience & Linguistics)

At the end of the school year, Jones was among seven Duke undergraduates awarded a prestigious Goldwater Scholarship, designed to encourage students to pursue math, science, and engineering.

Long-time DIBS Educator Honored for Undergrad Teaching Excellence

The Duke Alumni Association awarded its 2019 Alumni Distinguished Undergraduate Teaching Award to Leonard White, PhD, Associate Professor of Psychology & Neuroscience and Neurology, and Associate Director for Education at DIBS. Dr. White also co-leads the Bass Connections Brain & Society Theme. The award, which recognizes outstanding teaching and service to undergraduates, was presented in April during the Duke Founders’ Day convocation. Dr. White teaches the undergraduate courses, “Medical Neuroscience” and “Functional Neuroanatomy.”

From one of his student nominators: “Dr. White goes above and beyond his duties as a lecturer. I truly believe he spends as much time preparing for his rigorous class sessions every week as his students, and he possesses a wealth of neuroscientific knowledge that is unmatched by that of anyone else I have ever met.”
Graduate Education

Reflecting the collaborative nature of DIBS, our academic and research programs bridge many disciplines, departments, and programs. Students who come to Duke seeking an advanced degree related to neuroscience find many different opportunities and fields of inquiry, from the most basic molecular and cellular research to big data and clinical applications of new knowledge.

Flexibility is the key to Duke’s Neuroscience graduate program. The following DIBS programs provided innovative educational experiences for graduate students in the neurosciences in 2018-2019:

• **Cognitive Neuroscience Admitting Program (CNAP).** CNAP is a unique program allowing Neuroscience graduate students to participate in an interdisciplinary educational experience involving multiple departments and outstanding faculty teachers and mentors. DIBS coordinates training and required coursework for CNAP students and helps organize social and professional events, colloquia, and retreats. One of the program’s most popular features is that after two years of course work and laboratory rotations, students select both a primary department and two advisors with expertise in different sub-disciplines related to their area of interest. CNAP also offers a rich environment for training and research, with fMRI, EEG laboratories, and extensive facilities for psychophysical studies in humans, as well as behavioral and physiological studies in non-human primates and rodents. In 2018-2019, 29 CNAP graduate students studied at Duke.

Natasha Parikh, another CNAP student who successfully defended her PhD thesis in May, received the Dean’s Award for Excellence in Teaching from Duke’s Trinity College of Arts & Sciences.

Students who come to Duke seeking an advanced degree related to neuroscience find many different opportunities and fields of inquiry, from the most basic molecular and cellular research to big data and clinical applications of new knowledge.
During the DIBS strategic planning process, graduate students and postdocs requested more career development opportunities, including hearing from speakers who have a neuroscience background and hold jobs outside academia. For this event, DIBS partnered with the Department of Neurobiology to host Jeff Welch, PhD, a Duke Neurobiology alumnus. Welch discussed his work at Bioventus, a company specializing in orthobiologics, designed to enhance the body’s natural healing abilities. He has been part of the company since its inception in 2012, and is now one of company’s executive leaders. Prior to his business experience, Jeff spent nine years in academic science.

“Jeff has been incredibly successful at using his PhD toward hybridizing science and business ventures, leaving him with a wealth of experience in the scientific-technology industrial enterprise,” said David Gallegos, a student in the Neurobiology Graduate Training Program, who planned the event.

Welch discussed the importance of understanding the business side of companies, especially how to read and interpret financial spreadsheets and statements. He also emphasized the value of networking in finding jobs, encouraging attendees to “get out and meet everyone you can.”

Career Advice: ‘Get Out and Meet Everyone You Can’

• Annual Neuroscience Bootcamp. “Bootcamp” is a two-week immersive lecture, discussion, and laboratory course for graduate students in the Cognitive Neuroscience Admitting Program, Neurobiology, and other graduate programs. The course, held at the beginning of the academic year, is open to any graduate student with an interest in the brain. It provides a common knowledge base of neuroscience fundamentals; hands-on experience with techniques commonly used to explore cellular/molecular circuits, systems, and cognitive neuroscience; and an introduction to a wide variety of Duke faculty and helpful resources for ensuring a successful graduate career. The 2018 Neuroscience Boot Camp had 18 participants from Neurobiology, CNAP, Psychology & Neuroscience, Systems & Integrative Neuroscience, and Molecular Genetics and Microbiology.

• Certificate in Cognitive Neuroscience. This program makes education in the neurosciences available to students from any doctoral program on campus. Students must complete a year of didactic coursework and a year of attendance at journal clubs and seminars in cognitive neuroscience. A public lecture is also required for completion.

• DIBS Graduate Student Consortium. Any graduate student on campus with an interest in the brain sciences is invited to join the DIBS Graduate Student Consortium. In 2018–2019, the group increased its membership to 240 and added new programming to meet member needs. This year’s activities included:
  • Stress management workshop
  • Faculty debate: “Which system is best for understanding sensory processing and perception in general?”
  • Discovery Day outreach
  • Conversation with Dale Purves, PhD, Duke’s Geller Professor of Neurobiology Emeritus and renowned member of the DIBS Faculty Network
  • Trivia Contest & Year-end Social Event

Duke Neurobiology alumnus Jeff Welch, PhD (on left side in the gray suit jacket and white shirt) talked with graduate students and postdocs about careers outside academia. David Gallegos, Neurobiology graduate student and event organizer, is in the red hat.
Providing Exceptional Neuroscience Education

Postdoctoral Education

At the beginning of the 2018-2019 academic year, DIBS faculty mentors Nicole Schramm-Sapyta, PhD, and Leonard White, PhD, held a meeting with postdoctoral associates to get input on how best DIBS could support their professional growth and development. The meeting produced three major outcomes:

- **Expansion of the DIBS Postdoctoral Consortium.** This group now includes more than 180 postdoctoral associates from across the University and School of Medicine.

- **Works-in-Progress Seminar Series.** This new program provides postdocs the opportunity to present their research, at any stage, to their peers. In this supportive, low-pressure environment, postdocs provided and received valuable feedback and support.

- **A new DIBS resources website.** This page lists campus and other resources, plus helpful links, for postdocs and their families.

DIBS also supported other postdoctoral activities:

- **PARTNeR Lunch Series.** Postdocs and Residents Translating Neuroscience Research grew out of a desire for connection between Neuroscience postdoctoral trainees and resident physicians with a shared interest in brain function and mental health, with a goal of closing the gaps between laboratory/bench science and the bedside. The group met several times in 2018-2019, with support from DiBS.

- **Public Engagement Opportunities.** DIBS helps make sure graduate students and postdocs interested in engaging with the public have an opportunity to do so, both on and off campus:

  - **Bass Connections.** Many graduate students and postdocs participate in Bass Connections projects for the Brain & Society theme, serving as project managers. Beyond engaging with real-world issues in interdisciplinary research teams, graduate students and postdocs gain valuable skills in mentoring, project planning, and implementation. *(Please see Page 17 for a list of the 2018-2019 Brain & Society teams.)*

  - **Outreach.** Graduate students and postdocs participate in many DIBS public activities and events, including DIBS Discovery Day, interdisciplinary seminars, symposia, and external speaking and teaching engagements. These opportunities provide associates with valuable skills, including planning, promotion, and project management.

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“"This group presents a unique opportunity for Psychiatry residents and Neuroscience post-docs to enjoy lunch and stimulating discussions about how to help close the gaps between the bench and the bedside.”

—PARTNeR Co-leaders Yael Grossman, PhD, & Alexandra Bey, MD, PhD

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Duke brings neuroscience education to learners wherever they are! MOOCs—Massive Open Online Courses, via Coursera—allow DIBS and other Duke faculty to reach adult learners across the country and around the world. “Medical Neuroscience” remains one of the most popular MOOCs and is taught by Leonard White, PhD, Associate Director for Education at DIBS.

Other MOOCs taught by DIBS Faculty Network Members include:

- “Dog Emotion and Cognition,” Brian Hare, PhD, Evolutionary Anthropology
- “Visual Perception and the Brain,” Dale Purves, PhD, DIBS
- “Image and Video Processing: From Mars to Hollywood with a Stop at the Hospital,” Guillermo Sapiro, PhD, Electrical & Computer Engineering
- “Think Again, Parts I-IV: How to Understand Arguments, How to Reason Deductively, How to Reason Inductively and How to Avoid Fallacies,” Walter Sinnott-Armstrong, PhD, and Ram Neta, PhD, both in Philosophy

MOOCs: Bringing Neuroscience to Thousands—OUTSIDE the Classroom

“Enlightening, stimulating, perfect blend of top notch content and understandable videos. Thanks Prof. Groh!!! One of my best courses ever (on/off line)”

-Review of the MOOC, “The Brain and Space,” March 31, 2019
Building Brain Science Bridges Across Duke

The Duke Institute for Brain Sciences serves a vital role in creating and nurturing relationships among faculty, students, and staff from across campus. We do this by providing opportunities to interact through symposia, seminars, and small-group meetings, as well as more informal activities.

Connecting Faculty, Students Across Campus

In 2018-2019, DIBS supported more than 230 seminars, colloquia, symposia, meetings, graduate student and postdoctoral consortia events, Inclusion & Power Dynamics programs, and other career, networking, and special events. These attracted more than 3,600 faculty, students, trainees, and staff.

Most important, these events allowed Duke’s growing neuroscience community to connect in person, whether attending a symposium, discussing research activities, or participating in an informal program.

The DIBS “Cube” has become a popular gathering site for undergraduate and graduate students and trainees, as well as for networking and other events involving faculty and learners at all levels.

DIBS is also home to several undergraduate Neuroscience classes, as well as the Brain Lab, where undergraduates, graduate students, postdocs, and other trainees learn the intricacies of human brain anatomy taught by DIBS faculty. Our flexible meeting space and convenient location on the west side of campus helped attract new groups and events this past year.

Supporting Interdisciplinary Research Centers & Groups

DIBS houses and supports research centers and groups representing many interests and areas of expertise within the neurosciences and in complementary fields such as biostatistics, biomedical engineering, language, and philosophy. Together, these groups contribute significantly to the intellectual vitality at DIBS by providing access to nationally and internationally renowned researchers from other universities, as well as those from our own faculty.
Center for Cognitive Neuroscience (CCN).
The CCN brings together a diverse group of faculty focused on research and education in the psychological, computational, and biological mechanisms of higher mental function. Researchers examine the variability in these mechanisms among individuals, across the lifespan, and between species. Interests include perception, attention, memory, language, emotion, decision-making, social interaction, morality, motor control, executive function, and the evolution and development of mental processes, often using the latest imaging and other technologies.

CCN's weekly colloquium, held in the DIBS Multipurpose Room, is popular with faculty and students alike. This year, organizer Greg Samanez-Larkin, PhD, CCN Core Faculty Member and Assistant Professor, Psychology & Neuroscience, brought in a diverse group of speakers on topics such as how the brain learns mathematics and applying neuroscience to fashion algorithms.

The CCN colloquia also hosted scientists from outside academia, such as Teon Brooks, PhD. Dr. Brooks holds a doctorate in Cognitive Science from New York University, but now works as a data scientist testing new product concepts for the global technology company Mozilla. Brooks discussed, “A Cognitive Neuroscientist's Journey into Data Science.”

Adcock Named CCN Director
In August 2018, the DIBS Faculty Governance Committee announced the appointment of R. Alison Adcock, MD, PhD, Associate Professor of Psychiatry & Behavioral Sciences in the School of Medicine, as CCN Director.

“Dr. Adcock brings exceptional research, education, and community-building experience, as well as familiarity with the people and programs of both DIBS and CCN,” said DIBS FGC Chair Geraldine Dawson, PhD, in announcing the news. Adcock served as CCN's Associate Director for three years and is a long-standing member of the CCN Faculty and the DIBS Faculty Network.

The Director is responsible for CCN's intellectual and administrative leadership and plays a key role in facilitating a vibrant research and educational environment and culture for CCN faculty and learners. Dr. Adcock named Kevin LaBar, PhD, Professor, Psychology & Neuroscience, as CCN Associate Director. They meet regularly with CCN faculty to gather ideas and input on short- and long-term planning.

CCN Organizes 1st Smokies Symposium
The first Smokies Cognition and Neuroscience Symposium (SCANS) met in Asheville, N.C., in April. CCN, with support from DIBS, led the effort, which also involved faculty and students from Emory, Georgia Tech, and UNC-Chapel Hill.
**Center on Addiction and Behavior Change (CABC).** The CABC convenes faculty and students from many different departments to help translate basic research advances into effective prevention and treatment of addiction and other behavior disorders. The Center and DIBS host regular research seminars in fall and spring semesters. Seminar speakers addressed topics such as self-regulation of risk in early adolescence, nicotine and reward systems, and modification of addiction-like behavior with CRISPR/Cas9-mediated epigenomic editing.

In April 2019, the Center, DIBS, Duke CiPHERS (Cannabis-Induced Potential Heritability of Epigenetic Revisions in Sperm), and the John Templeton Foundation co-sponsored a major symposium, “Altered States of Cannabis Regulation: Informing Policy with Science.” CABC Co-Director Ed Levin, PhD, Psychiatry & Behavioral Sciences, brought in speakers from University of California, San Diego; Icahn School of Medicine at Mount Sinai; Arizona State University; RAND Corp., and Duke. Topics included cannabis/cannabinoids as medicine; their effects on behavior, cognition, development, and physiology; and policy considerations for cannabis legalization.

**Center for Neural Engineering and Neurotechnology.** This Center, the newest at DIBS, focuses on using engineering techniques to understand the mechanisms of and develop advanced approaches to electrical stimulation of the nervous system to restore function to individuals with neurological impairment or injury. Warren Grill, PhD, Edmund T. Pratt Jr. School Professor of Biomedical Engineering, a member of the DIBS Faculty Network, leads this effort.

**Duke Center for Interdisciplinary Decision Science (D-CIDES).** D-CIDES brings Duke’s diverse strengths in the decision sciences into a single community for programs, education, and new research collaborations. The Center’s researchers study behavioral economics, judgment and decision-making, marketing, neuroeconomics, medical decision-making, and addiction. It is affiliated with DIBS and the Social Science Research Institute.

Dr. Grill, left, introduces Qi Wang, PhD, Columbia University, presenter for one of the Neural Engineering seminars. Dr. Wang addressed “Reading & Writing the Neural Code: Initial Steps toward Enhancing Perception & Cognition Using Brain-machine Interfaces.”

Duke Institute for Brain Sciences
Duke Center for Autism and Brain Development.
The Duke Center for Autism and Brain Development is a designated National Institutes of Health Autism Center of Excellence and is conducting research aimed at improving screening, treatment approaches, and outcomes for individuals with autism and attention deficit hyperactivity disorder. The Center’s interdisciplinary research reaches across many different disciplines at Duke, including neuroscience, genetics, engineering and computer science, psychiatry, and psychology. One part of the research program involves several clinical trials that are testing new treatments ranging from cellular and molecular approaches to parent coaching. The Center’s scientists are also harnessing technology and data science to create more effective autism screening tools and better ways to measure outcomes in clinical trials both in the US and globally.

The Center provides clinical services to patients with autism from infants to young adults. The Duke Autism Clinic is staffed by an interdisciplinary clinical team that includes psychologists, psychiatrists, social workers, and nurses. The Center is committed to inspiring, educating, and training the next generation of autism researchers and clinicians and supports learners from undergraduate through postdoctoral levels. Finally, the Duke Center for Autism and Brain Development engages in a wide range of outreach activities with the community, including an annual Autism Awareness Month event that celebrates neurodiversity (see sidebar, as well as p. 7).

The Center also co-sponsored DIBS Discovery Day, providing an information table for families from a wide variety of backgrounds. With the Center’s help, Discovery Day was able to include a one-hour sensory-friendly period prior to the event’s start so that children and adults on the spectrum or with other developmental issues could attend in advance of crowds.

Father of son with autism urges moving from inclusion to a purpose-filled life

The Hon. Mike Lake’s Twitter account description sums up his busy life: “Canadian Conservative Member of Parliament for Edmonton-Wetaskiwin. Shadow Minister for Youth, Sport and Accessibility. #Autism parent. @EdmontonOilers fan. (“Shadow Minister” refers to the fact that his party is not currently in power.)

What the words cannot convey is the bond Lake shares with his 23-year-old son, Jaden, who has autism. Experiencing their love in person was the highlight of Lake’s April 15 presentation at Duke, “Expect More: An Autism Adventure,” an evening event recognizing Autism Awareness Month. More than 100 people attended the event organized by the Duke Center for Autism and Brain Development and held at DIBS, also a co-sponsor.

Lake has been a global autism advocate since Jaden was a youngster. When asked what is most important to him about advocacy, Lake said, “We want to challenge the way people think about ‘normal.’” Inclusion [of people with different abilities] is good, he said, but it’s not the ultimate goal. “I want us to move beyond inclusion to contribution—to do a better job of unlocking each person’s potential,” he said. “Our purpose is to help others find their purpose.”

In her remarks, Center Director Geraldine Dawson, PhD, echoed Lake’s message, describing the event as, “a celebration” of neurodiversity, the broader autism community, and the valuable contributions of people with autism to society.
Research Groups

• **Computational & Theoretical Neuroscience Research Group** — New for 2018–2019, this group brings together theoretical and experimental researchers from across Duke who are interested in understanding and developing formal mathematical models to describe the brain’s processing of information. The aims of the group are to increase the community’s understanding of computational and theoretical approaches to studying the brain, to share ongoing research, and to foster collaborations, especially between theorists and experimentalists. They hold regular seminars and sponsor a journal club.

• **Cognitive, Auditory & Neural Bases of Language & Speech Group (CNBLS)** — CNBLS had a very active year. The group, which explores the many aspects that contribute to our unique ability to generate and communicate via language and speech, brought in outstanding interdisciplinary speakers, including:
  - Peter Gordon, PhD, Director, Language, Cognition, and Brain Lab, UNC-Chapel Hill, on “Rapid Naming as a Measure of Reading Ability: Eye-voice Analyses and the Effects of Aging”
  - Howard Francis, MD, MBA, Chief, Division of Head and Neck Surgery and Communication Sciences, Professor of Surgery, Duke School of Medicine, on “Cochlear Implantation Across the Lifespan”
  - Stephan Meylan, PhD, Duke Postdoctoral Associate, Psychology & Neuroscience, on “Evaluating Probabilistic Language Models with Serial Reproduction”

• **Neurohumanities Research Group** — Researchers in this area explore complex models of language and the brain that incorporate a more interactive view of neurological processes in cultural context; the causes and consequences of stereotyping and system justification; the role of religious beliefs and political ideology; and artificial intelligence. The group, co-sponsored by DIBS and the Franklin Humanities Institute, brings into conversation humanists and neuroscientists on issues that concern both groups but are researched and taught with different discourses, methodologies, and technologies. The DIBS Neurohumanities group partnered with Duke’s Mellon Humanities Futures Working Group to present a fascinating workshop, “Mind, Art, Artifact,” featuring Lambros Malafouris, PhD, Research and Teaching Fellow in Creativity, Cognition, and Material Culture, at Keble College at Oxford.

• **Neuroimmunology & Glia Group (NGG)** — The NGG explores the key role immune molecules play within the brain in normal processes including sleep, metabolism, learning, and memory. The group also investigates how glia, astrocytes, and microglia shape brain development, plasticity, and behavioral outcomes throughout the lifespan. The group sponsors seminars and an annual retreat known as “GliaCamp.” Some of this year’s retreat attendees are pictured opposite with one of the keynote speakers, Marco Colonna, MD (center), Robert Rock Belliveau MD Professor, Pathology & Immunology, Washington University School of Medicine in St. Louis. Live tweets using the hashtag #GliaCamp2019 generated more than 12,000 impressions and 700 engagements.
Encouraging Engagement through Interdisciplinary Events

Each year, DIBS connects members of the broader neuroscience community at Duke by supporting large, interdisciplinary events on current advances in research. The events feature faculty experts from Duke and other major research institutions, and attract hundreds of participants from across campus.

**Distinguished Lecture/Symposium: NIMH Director Josh Gordon Keynotes Event**

This year, DIBS launched the Distinguished Lecture & Symposium. The event’s theme was, “From Brain Circuits to Behavior: How Technology is Transforming the Science of Mental Health.” Joshua A. Gordon, MD, PhD, Director of the National Institute of Mental Health, was the keynote speaker. Duke faculty presenters were Kafui Dzirasa, MD, PhD, Psychiatry & Behavioral Sciences, and Guillermo Sapiro, PhD, and David Carlson, PhD, Pratt School of Engineering.

More than 300 registered for the event, which included a poster exhibition and contest. Before the symposium, Dr. Gordon visited with DIBS faculty and ate lunch with graduate students and postdoctoral associates. During the lunch, at right, he described his own career path and shared insights about the NIMH and its funding priorities. He then visited the poster exhibition, talking with presenters and tweeting his experiences via @NIMHDirector.

“#GliaCamp2019 was a blast ... the student/trainee organizers were amazing too!”

–Tweet by Daniel Saban, PhD, Ophthalmology.

Dr. Saban, Cagla Eroglu, PhD, Cell Biology, and Anthony Filiano, PhD, Neurosurgery, all in the School of Medicine, are co-conveners of the DIBS Neuroimmunology & Glia Research Group. Glia Camp is the group’s annual retreat.
The DIBS “Cube” was built to provide space suitable for lectures, classes, and large events. The DIBS Multipurpose Room seats up to 130 and is convenient to campus and the medical center. During the school year, DIBS staff support weekly seminars and colloquia for the Center on Cognitive Neuroscience and the Center on Addiction & Behavioral Change, as well as special guest speakers such as Doris Tsao, PhD.

Dr. Tsao was invited by the Department of Psychology & Neuroscience and hosted by Jennifer Groh, PhD. She is a world-renowned neuroscientist and professor of Biology at the California Institute of Technology, an investigator at the Howard Hughes Medical Institute, and a 2018 MacArthur Fellow in Neuroscience. Her talk, “How the Brain Represents Objects,” drew an overflow crowd of faculty, graduate students, and postdocs.

Inclusion & Power Dynamics in Academia
DIBS serves a broad and diverse group of Duke faculty, students, trainees, and staff. During this past year, with funding support from the Duke Office of Faculty Advancement, DIBS and an interdisciplinary planning committee developed a series of programs addressing important issues related to diversity, inclusion, and the differing power dynamics of the research environment.

2018-2019 Programs
Three programs were held during the fall semester:

1. Panel discussion about available Duke resources for reporting/discussing work incidents, with presenters from the Office of Institutional Equity, Duke Women’s Center, Office of Faculty Advancement, Ombuds, Center for Sexual and Gender Diversity, and the School of Medicine’s Office for Faculty. A counselor was available onsite for anyone who needed to talk with a professional concerning problematic work situations.

Steve Lisberger, PhD, left, Chair of the Department of Neurobiology, discusses the artwork with a colleague.

“The Beautiful Brain: The Drawings of Santiago Ramón y Cajal”
This very special event brought the DIBS community to the Ackland Art Museum in Chapel Hill to view the exquisitely detailed drawings of the famous Spanish neuroscientist Santiago Ramón y Cajal. The event was co-sponsored by DIBS and the Department of Neurobiology in the School of Medicine.

Summer School in Social Neuroscience and Neuroeconomics
For the second summer, Greg Samanez-Larkin, PhD, and the Scientific Research Network on Decision, Neuroscience, and Aging, which he co-founded, brought this exciting event to DIBS. Faculty, students, and trainees from across the country met to discuss topics such as Social Perception and Judgment, Social Cognition, and Decision Making.

Multipurpose Space for a Multidisciplinary Community

• Interactive performance on power dynamics, with acting troupe Theater Delta, focusing on the powerful effects mentor/faculty behavior can have on mentees_students.

• Presentation and discussion on difficult conversations, with Ann Brown, MD, School of Medicine, and Cathie Siders, PhD, a psychologist specializing in organizational consulting and executive coaching.

Spring semester brought four programs and a series on mentorship skills:

• Livestream of the Society for Neuroscience’s virtual conference on “Mitigating Implicit Bias”

• Presentation by Damian Stanley, PhD, Adelphi University, on “Understanding the Neuroscience of Implicit Bias,” held in conjunction with the colloquium series for the Department of Psychology & Neuroscience.

• Two ally training workshops for graduate students and staff, and faculty, respectively.

• Four-part “Entering Mentoring” program for graduate students and postdocs, led by Kendra Seaman, PhD, a Duke postdoctoral scholar, and PhD student Brenda Yang.

Due to success of the series, the Duke Office of Faculty Enhancement and the DIBS Faculty Governance Committee agreed to continue funding this important initiative in 2019-2020. Planning is being led by committee members Kathryn Dickerson, PhD, Assistant Professor, Psychiatry & Behavioral Sciences; Shabnam Hakimi, PhD, Postdoctoral Associate; Melissa Segal, Administrator, Neurobiology; Lamercie Saint-Hilaire, MD, Family Medicine; and DIBS COO Nicole Schramm-Sapyta, PhD.

“We are very excited to continue our efforts next year and are thrilled to have the continued support of the Office for Faculty Advancement and DIBS.”

—Planning Committee, from Faculty Development Seed Grant Program Project Report

Speakers for the first program in the Inclusion & Power Dynamics Series provided an overview of services available to the Duke community when reporting/discussing work incidents. Afterward, audience members continued the conversation (above).

Trending in the Right Direction

Following each event, DIBS administered a questionnaire asking attendees to provide feedback. Most relevant for this report were the questions asking attendees to identify their familiarity as well as their comfort level with the topic prior to and following the event. In every instance, the needle moved in the positive direction, meaning individuals felt more familiar with and more comfortable with the topic following the event than prior to it.

From attendees (aggregated across the seven interactive events):

What was best/most useful about the program?

• ‘Engaging content given along w/examples’

• ‘Learning about interventions that show promise’

• ‘Distinction between structural and implicit bias’

• ‘Tangible recommendations, background info about what doesn’t work’
Community Engagement: Inspiring, Learning from Stakeholders

DIBS scholars work with and learn alongside a variety of community stakeholders in Durham and around North Carolina to stimulate curiosity about the brain and ensure the relevance and applicability of our work.

Dynamic, two-way communication between scientists and members of the public benefits all. The people participating in our events and other activities gain information and understanding around the research related to DIBS. At the same time, faculty, students, and staff make connections outside academia, which inform research projects and influence real-world policies.

Connecting Faculty & Students with the Community

DIBS outreach activities attract hundreds of learners each year, from toddlers and teens to industry representatives and retirees. We help promote diversity in the brain sciences by ensuring students from diverse socioeconomic and racial/ethnic backgrounds are exposed to neuroscience at a young age, demystifying the field and providing role models. We are especially pleased with how many DIBS graduate students and postdoctoral associates are eager to participate in these activities.

In 2018-2019, DIBS faculty and students reached out through many different venues:

• **In Raleigh, through events at the N.C. Museum of Natural Sciences.** This year, Kati Healey, PhD, a postdoctoral associate, recruited an undergraduate student and a researcher from the National Institute for Environmental Health Sciences to staff an exhibit demonstrating the effects of alcohol on cognitive function. *(See story, next page)*

• **In the Durham Public Schools, through the School of Medicine’s “Building Opportunities and Overtures in Science and Technology” (BOOST) program.** DIBS faculty, with medical students, neuroscience majors and others, work with DPS students in 5th through 8th grade to excite young people about science. They led several hands-on workshops with children and their science teachers from several under-resourced schools.

Durham’s CIT awards event recognized community partners, including Duke faculty Nicole Schramm-Sapyta, PhD (seated first row, center); Leonard White, PhD (standing, far left); and Data+ Director Paul Bendich, PhD (next to Dr. White).

• **In Durham, through the Crisis Intervention Team (CIT).** Duke students in the Bass Connections and Data+ programs, led by faculty members Andrew Muzyk, PharmD, Psychiatry & Behavioral Sciences, and Nicole Schramm-Sapyta, PhD, DIBS Chief Operating Officer, have a long-standing relationship with the CIT. The teams analyzed data from the Durham County jail to examine the intersection of mental health and recidivism. In December, this effort was recognized at the annual CIT Awards Banquet. Dr. Schramm-Sapyta was named CIT’s Volunteer of the Year, and the Data+ and Bass Connections programs were honored as Community Partner of the Year.

“This is a fantastic example of the potential for really deep, enduring partnerships between Duke and local institutions and law enforcement in the city and county of Durham.”

—Ed Balleisen, PhD, Duke Vice Provost for Interdisciplinary Studies
• Through the Triangle Chapter of the Society for Neuroscience. DIBS faculty participate in this group’s events, including the annual meeting, which DIBS also helps publicize.

Bringing the Community to Campus

Each year, DIBS hosts and co-sponsors many events open to the public and designed to inform people about the vital neuroscience research and education activities at Duke. They include:

• DIBS Discovery Day. For the second year in a row, DIBS hosted a record-breaking crowd, with 565 children and adults attending the 2019 Discovery Day. The event reinforces the DIBS research and education priorities, as well as community outreach.

For the first time, DIBS made available a sensory-friendly portion of the afternoon, for one hour before the event’s official opening, providing a less noisy and crowded experience. With assistance from the event’s co-sponsor, the Duke Center for Autism and Brain Development, a “quiet room” was made available for people on the spectrum and others who needed a little down time. Seventy-five people attended during that first hour. Duke Center for Autism staff brought interactive computer equipment to help people understand communications challenges experienced by those on the autism spectrum.

Bass Connections Brain & Society team members hosted activities and exhibits demonstrating their research findings, such as exercising to improve mental health and

Demonstrating the ‘Stroop Effect’

One of this year’s adults-only theme events at the N.C. Museum of Natural Sciences, a long-time DIBS partner, was “Speakeasy,” an homage to the “Roaring 1920s.” That period included Prohibition, when it was illegal to produce, sell, or buy alcohol in the U.S. “Speakeasies,” private clubs providing (illegal) alcohol, often obtained from smugglers known as “bootleggers,” sprang up across the country.

Kati Healey, PhD, a DIBS postdoctoral associate who studies addiction, Jackie Soja, a Duke undergraduate, and Leslie Wilson, PhD, a postdoctoral associate with the National Institute for Environmental Health Science, joined in the evening’s festivities by hosting a booth designed to enhance awareness of alcohol’s negative effects on cognition: “Bootleggers’ Brain: Alcohol & Cognitive Interference.” Attendees were given a test using words and colors in which the participants had to say the color of the ink in which the word is written, not the word itself. For example, if asked the color of the following word, GREEN, the correct answer is “red,” not green, the written word itself. The incongruity between word and color confuses the brain, interfering with cognition, and is known as the “Stroop effect.” Results showed alcohol clearly impaired the ability to give correct answers. ●
cognition; the relationship between human morality and artificial intelligence; and using eye movements to track traumatic brain injuries. Other activities included a coloring corner where youngsters could make cardboard brain “hats,” and the ever-popular Brain Lab, where visitors could touch an actual human brain.

• Duke Alumni Reunion Weekend program, “On Our Minds: Brain Health Know-how,” April 12. Three members of the DIBS Faculty Network presented a multidisciplinary look at the aging brain to more than 200 returning Duke alumni. DIBS Chief Operating Officer, Nicole Schramm-Sapyta, PhD, moderated the talks and panel discussion:
  • “The Adaptive, Aging Brain,” Greg Samanez-Larkin, PhD, Psychology & Neuroscience
  • “Healthy Aging vs. Alzheimer’s Disease: Does immune-regulated brain metabolism play a critical role?” Carol A. Colton, PhD, Neurology, Duke School of Medicine
  • “Environmental Influences on Quality of Life & Disease Progression in Dementia,” Eleanor S. McConnell, PhD, RN, Duke School of Nursing

“The aging brain is magnificently plastic and adaptive.”
–Panelist Greg Samanez-Larkin, PhD

“Every part of the community has a unique role in meaningfully supporting people with dementia and their family and care partners. Success will depend on gaining support from a multitude of community stakeholders.”
–Panelist Eleanor S. McConnell, PhD, RN, Duke School of Nursing

• The Duke Center for Autism and Brain Development and DIBS recognized National Autism Awareness Month on April 15 with remarks by the Honourable Mike Lake, member of Canadian Parliament. He was joined by his son, Jaden, who is on the autism spectrum. In his presentation, “Expect More: An Autism Adventure,” Lake emphasized the need for society to think differently about what constitutes “normal.” (Please see page 27 for more information about this event.)
Sharing Brain Science through Media & Commentary

DIBS Faculty Network members share their expertise with local, national, and international media outlets. In 2018-2019, faculty research was publicized by more than 200 media outlets. Follow us on Twitter, @DukeBrain, to see media coverage and other faculty accomplishments.

Teaching Students How to Feed Their Brain

College students often worry about their grades but also are notorious for their unhealthy diets of pizza, burgers, and other calorie-dense food. “Neuroscience & Nutrition” is a new interdisciplinary undergraduate course co-taught by Minna Ng, PhD, Assistant Professor of the Practice, Psychology & Neuroscience, Trinity College of Arts & Sciences, and Franca Alphin, MPH, Director of Nutrition Services at Student Health and Associate Professor, Community and Family Medicine, in the School of Medicine. It seeks to show students how nutrition and cognition are related. The course is one of the interdisciplinary neuroscience-related courses offered through the Bass Connections Brain & Society Theme, which DIBS administers.

Dr. Ng, a DIBS Faculty Network Member, conveyed her passion on the topic to the broader campus via an op-ed in the Aug. 30, 2018, issue of The Duke Chronicle, “Feeding the college student’s brain with more than ideas.” She encourages students to make healthier choices— for their bodies AND their minds:

“Wellness has become a popular topic on campuses across the country and colleges are investing resources to encourage healthy student behaviors. To make a lasting change in students’ lives, perhaps a class in nutrition should be required as a part of the core college curriculum, right alongside writing and math. Our students can actively nourish their bodies and minds as soon as they enter that all-you-can eat cafeteria. They can choose foods to support their academic success. Regardless of their majors, knowing how to nourish their bodies and minds will have a guaranteed payoff.”
DIBS By the Numbers, 2018–2019

COLLABORATIVE RESEARCH

- Duke faculty research teams received 2018–2019 Research Incubator Awards totaling $500K
- 6
- 186 DIBS Faculty Network members
- 10 campus & medical school departments represented on Incubator teams
- 7:1 return on investment for dollars invested in Incubator Awards, 2013–2018

Members of Theater Delta, a social-justice acting troupe, act out a difficult conversation between a student and faculty member, part of the DIBS 2018–2019 Inclusion & Power Dynamics in Academia series.
2019 Summer Neuroscience Program participants celebrate completing a successful team-building experience.

**UNDERGRADUATE EDUCATION**

13 Summer Neuroscience Program participants

13 Bass Connections Brain & Society teams

**GRADUATE STUDENTS & POSTDOCTORAL FELLOWS**

26 enrolled in Cognitive Neuroscience Admitting Program

18 enrolled in the annual Neuroscience Bootcamp

19 enrolled in the Certificate in Cognitive Neuroscience Program

420 members signed up for Graduate Student & Postdoc Consortia
DIBS By the Numbers, 2018–2019

OUTREACH & ENGAGEMENT

237 interdisciplinary research events hosted at DIBS

>3,600 faculty, students, fellows at DIBS research events

565 attendees, 2019 DIBS Discovery Day (record crowd)


At right, a youngster adds her special touch to the poster seeking Discovery Day suggestions for being more active.
Leadership & Governance

At the Duke Institute for Brain Sciences, we are fortunate to have a committed group of leaders who contribute to our success. We want to acknowledge and thank, especially:

**Duke Leadership**
- Vincent Price, PhD, President, Duke University
- Sally Kornbluth, PhD, Provost, Duke University
- Mary Klotman, MD, Dean, Duke School of Medicine
- Ed Balleisen, PhD, Vice Provost for Interdisciplinary Studies
- Colin Duckett, PhD, Vice Dean for Basic Research, School of Medicine

**DIBS External Advisory Board**
*Chip Newton, Chair*
- James Barrett
- Alice Bender
- Michele Cascardi
- Rachel Coulter, OD
- Andrew Feinberg, MD
- Alex Geier
- Bethann Horey
- Kimble Jenkins
- Peter Kanaris
- Sophie Katz
- George Lamb, III
- Robert Penn, Chair Emeritus
- James Schwab
- Katherine Shah
- Lawrence R. Stoehr
- Harry Stylli, MD
- Sonya Wakil, MD

*Provost Kornbluth welcomes attendees at the 2019 DIBS Distinguished Lecture & Symposium*
**DIBS Faculty Governance Committee**
Geraldine Dawson, PhD, Committee Chair; Psychiatry & Behavioral Sciences
Alison Adcock, MD, PhD, Psychiatry & Behavioral Sciences
Nicole Calakos, MD, PhD, Neurology
Kafui Dzirasa, MD, PhD, Psychiatry & Behavioral Sciences
Tobias Egner, PhD, Psychology & Neuroscience
Warren Grill, PhD, Biomedical Engineering
Scott Huettel, PhD, Psychology & Neuroscience
Steve Lisberger, PhD, Neurobiology
Nicole Schramm-Sapyta, PhD, DIBS Chief Operating Officer
Walter Sinnott-Armstrong, PhD, Philosophy
Fan Wang, PhD, Neurobiology
Leonard White, PhD, Neurology

*Steve Lisberger, PhD, Professor and Chair, Neurobiology, presents to the EAB about the School of Medicine’s Translating Duke Health initiative. He leads one of the core focus areas, “Brain Resilience and Repair.”*
DIBS Faculty & Staff

Nicole Schramm-Sapyta, PhD, Chief Operating Officer
Leonard E. White, PhD, Associate Director for Education

Administration
Shuntoya Lee, Assistant Director for Administration
Robin Knott, Financial Analyst
Diane Masters, Research Development
Kathy Neal, Communications
Trina Rodriguez, Program Coordinator
Lynette Thacker, Grants & Contracts
Jill Watkins, Human Resources

Undergraduate Education
Tyler Lee, Summer Neuroscience Program & Bass Connections Brain & Society Theme
Thomas Newpher, PhD, Assistant Professor of the Practice & Director, Summer Neuroscience Program

Graduate Education
Colleen Bauer, Program Coordinator

Neuroimaging
Andrew Michael, PhD, Director of Imaging Analytics & Informatics

Information Technology
Yimin Wei, PhD, Information Technology Strategy & Management
Andrew Ballard, Computer Technician
Ed McLaurin, Information Technology User Support

DIBS staff joined other volunteers to prepare and deliver lunches for Durham’s Meals on Wheels program, one of several community-service activities during 2018-2019.
Connecting Minds
~
Advancing Neuroscience
~
Improving Lives