



DUKE INSTITUTE FOR BRAIN SCIENCES
STRATEGIC PLAN 2018 – 2021
“BLUEPRINT FOR ADVANCING BRAIN SCIENCES AT DUKE”



DUKE UNIVERSITY

Duke Institute for Brain Sciences, 308 Research Drive, Duke University, Durham, NC 27708

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Connecting minds
Advancing neuroscience
Improving lives

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STRATEGIC PLANNING STEERING COMMITTEE

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EXECUTIVE SUMMARY

Healthy brain function defines who we are and is crucial to our quality of life and productivity as individuals and as a society. Dynamic and complex relationships between genetics and environment (e.g., nutrition, exercise, stress, infections, social connections) influence each person’s ability to reach their full potential and ultimately to contribute to the world in which we live. By understanding both brain dysfunction and healthy function and how they develop, we can optimally promote brain health and prevent and treat the wide range of brain diseases and disorders.

It is estimated that the annual cost of neurological disorders is a staggering \$789 billion (in 2014 dollars)¹. The percentage of the U.S. population that is 65 years or older will nearly double between 2011 and 2050, and age is a primary risk factor for many neurological disorders, so these costs will continue to increase. Other conditions that affect the brain likewise have a heavy cost. For example, the estimated annual cost of autism² to the U.S. economy is more than \$265 billion, on par with diabetes. And more than \$200 billion is spent annually on mental illnesses such as depression, anxiety, and addiction; serious mental illness results in approximately \$193 billion in lost earning per year³. Thus, our investments in brain sciences at Duke have substantial real-world impact that touches the lives of each and every one of us.

With its long-standing commitment to excellence in interdisciplinary research and education, Duke is well-positioned to be at the forefront in advancing brain sciences. Our faculty’s expertise spans the full range of inquiry, from understanding basic mechanisms and development to the application of brain sciences to addressing major public health and policy-oriented challenges. The mission of the Duke Institute for Brain Sciences (DIBS) is to promote interdisciplinary brain science and translate discoveries into solutions for health and society. Our goal is to break down barriers between disciplines and promote collaboration to achieve this mission. The purpose of this strategic plan is to define this path and direct resources for maximum effect.

“BLUEPRINT FOR ADVANCING BRAIN SCIENCES AT DUKE”

We sought to develop a strategic plan that is well-aligned with Duke’s larger strategic priorities as described in the Provost’s *Together Duke* and the Chancellor’s *Advancing Health Together*

¹ Clifton L. Gooch, Etienne Pracht, Amy R. Borenstein. The Burden of Neurological Disease in the United States: A Summary Report and Call to Action. *Annals of Neurology*, 2017.

² Buescher, A. V. S., Cidav, Z., Knapp, M., & Mandell, D. S. (2014). Costs of autism spectrum disorder in the United Kingdom and the United States of America. *JAMA Pediatrics*, 168(8), 721–728.

³ <https://www.nami.org/Learn-More/Mental-Health-By-the-Numbers>

strategic plans, as well as the *Translating Duke Health Initiative's Brain Resilience and Repair* focus area, led by Stephen Lisberger. By aligning our plan with these university-wide priorities, we aim to leverage and create synergies between the efforts of DIBS and Duke's broader investments. Consistent with *Together Duke*, this *Blueprint for Advancing Brain Sciences at Duke* leverages investments in the natural sciences and seeks to promote a transformative educational

"My hope is that part of the priorities for DIBS will include cross disciplinary exchanges between basic scientists and clinicians in the trenches. "

- Duke faculty member

experience, particularly in doctoral and postdoctoral education. In line with *Advancing Health Together*, our plan directs resources to accelerate discovery and team-based science, promote transformative research in

areas of great impact, and enhance collaborative research across Duke University. *Translating Duke Health*, a key component of *Advancing Health Together*, includes the neurosciences as one of six areas of targeted investment. This neuroscience initiative, which will be fully integrated with our strategic plan, provides resources (seed funding, strategic faculty hires, seminars) that target the science of neuroplasticity, brain resilience, and brain repair. The goal of these investments is to discover and implement effective methods for detecting and preventing or delaying the onset of the symptoms of neurological disease, as well as for repairing the dysfunctional brain circuits associated with such diseases. Equally important is promoting brain health and optimizing neurological function.

WHAT ARE OUR PRIORITY INVESTMENTS?

1. Position Duke for ***success in obtaining NIH and other sources of external research and training funding*** through investments in: (a) activities that promote interdisciplinary collaboration, (b) seed funding for innovative, interdisciplinary research; (c) state-of-the-science infrastructure, technology, and tools that allow us to probe brain structure and function (e.g., animal and human MRI); and (D) DIBS staff support to assist faculty in applying for large, interdisciplinary research and training awards.
2. Invest in the ***full continuum of neuroscience research***, capitalizing on our strengths in basic and translational neuroscience, as well as in clinical research. These include investments aimed at addressing major public health challenges, including neurodegenerative diseases (e.g., Alzheimer's Disease, Parkinson's Disease), neurodevelopmental disorders (e.g., autism, ADHD, epilepsy), and neuropsychiatric disorders (e.g., addiction, anxiety), as well as reducing the negative effects of stress and chronic pain. Current research points to novel compounds and behavioral interventions that hold promise for halting neurodegeneration and promoting neurogenesis and synaptic repair. Thus, in addition to investing in basic science and new methods and technologies, we will invest in research that has the potential to identify

biomarkers and mechanisms (e.g., neuroinflammation) and inform therapies that can prevent, ameliorate, and cure brain diseases and disorders.

3. Direct resources to community-building activities (e.g., Centers, Research Groups, Seminars) and educational experiences (e.g., workshops, symposia) that will allow Duke to **remain at the forefront in fields that are revolutionizing the study of the brain** such as neural engineering, neurotechnology, and computational neuroscience. This priority is well-aligned with Duke’s investments in quantitative expertise, including computational biology, computer science, engineering, and data science.
4. Nurture the success of the next generation of interdisciplinary neuroscientists by **enhancing the graduate and postdoctoral experience in the brain sciences** at Duke. This will be achieved by (a) recruiting and supporting women and underrepresented minorities in neuroscience graduate and postdoctoral education; (b) providing mentoring and interdisciplinary team-based educational and networking experiences for graduate students and postdocs; and (c) preparing graduate students and postdocs for diverse career pathways both inside and outside of academia, including “soft skills” that are critical for success.
5. Engage in **fields outside of traditional neuroscience that have relevance to the brain**, including public policy, philosophy, law, religion, and the arts and humanities. Investments in these areas will accelerate translation of scientific findings to inform policy and practice, ensure that the ethical implications of neuroscience research are carefully considered, and allow exploration of the neurosciences within a broader cultural context.
6. **Enhance communication** among those who are passionate about the brain sciences within Duke, as well as with donors, policy makers, and other stakeholders, and with the broader local, national, and international communities.

“Because more than any other organ, the study of the brain gets to the nexus of who we are, research in Brain Science has great import for Philosophy, Humanities, Arts, Religion, Public Policy and Law.”

- Duke Faculty member

STRATEGIC PLANNING PROCESS

The purpose of the strategic planning process was to plot a course forward after the recent restructuring of the governance and leadership of DIBS. The new governance structure presumed a deeper engagement of faculty in setting strategic priorities for DIBS. Specifically, DIBS is now led by a Faculty Governance Committee (FGC), headed by a faculty chair (Geraldine Dawson). In addition, a new position at DIBS was created – Chief Operating Officer – responsible for overseeing day-to-day operations and implementing the vision laid out by the FGC. The FGC has nine voting members, representing the broad diversity of constituencies interested in brain

sciences at Duke. Members currently include Alison Adcock, Psychiatry; Nicole Calakos, Neurology; Geraldine Dawson, Psychiatry; Kafui Dzirasa, Psychiatry; Tobias Egner, Psychology & Neuroscience; Warren Grill, Biomedical Engineering; Walter Sinnott-Armstrong, Philosophy and Kenan Institute for Ethics; Fan Wang, Neurobiology; and Len White, Neurology and DIBS. There are also three ex officio members: Scott Huettel (Chair, Department of Psychology & Neuroscience); Steve Lisberger (Chair, Department of Neurobiology); and Nicole Schramm-Sapyta (Chief Operating Officer). One of the first charges to the FGC was to set the strategic priorities for our efforts and investments at DIBS.

AN INCLUSIVE PROCESS

Two principles guided the strategic planning process: (1) Priorities should be designed to serve the broad Duke community across Arts and Sciences, Engineering, and the School of Medicine; and (2) the process by which priorities are defined should be broadly inclusive, reflecting a deep engagement of faculty, graduate students, and postdoctoral scholars at Duke. To this end,

“We need DIBS to successfully bring together the many diverse streams of brain science at Duke; DIBS needs us to work together to make the most of this confluence.”

- Duke faculty member

members of the larger Duke community were invited to share their ideas, concerns, or suggestions via a dedicated portal on the DIBS website, by email or phone calls directly to FGC members, and during nine Town Hall Meetings held from late August

through September 2017. The Town Hall meetings were scheduled at varying times and locations across the University campus and the School of Medicine to maximize range of input. Each Town Hall was co-hosted by members of the FGC and the Chief Operating Officer. Faculty, students, and other members of the Duke community who wished to have a voice in shaping the future of DIBS were encouraged to participate. Over 200 persons attended the town halls and more than 30 suggestions were offered on the DIBS website. Individual members of the FGC also met with the Provost, Vice Provost for Interdisciplinary Studies, Vice Dean for Basic Science in the School of Medicine, Chairs of Psychiatry and Behavioral Science, Neurobiology, and Psychology & Neuroscience, as well as individual junior and senior faculty leaders to obtain their perspectives. Finally, in October of 2017, the FGC met with the DIBS External Advisory Board to solicit their feedback and input. All suggestions were catalogued for later discussion by the Strategic Planning Steering Committee.

We engaged Laura Howes, Director of Bass Connections at Duke, to facilitate a one-day strategic planning retreat on October 9, 2017. She has served three years as Associate Director of Strategy and Operations in the Office of the Vice Provost for Interdisciplinary Studies and, thus, was well

suiting for this role. The strategic planning workgroup was composed of all members of the FGC (voting and non-voting), two junior faculty members (David Carlson, Kathryn Dickerson), and two graduate students (Mai-Anh Vu and Natasha Parikh), as well as Tanya Schreiber, DIBS staff member. Following the retreat, the FGC met to discuss and prepare the strategic plan.

MISSION, VISION, AND VALUES

MISSION STATEMENT

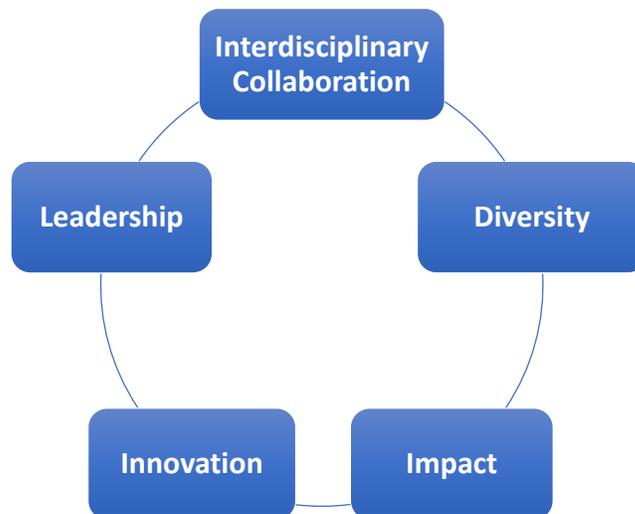
The mission of DIBS is to promote interdisciplinary brain science and translate discoveries into solutions for health and society.

VISION

Our vision is a scientific and scholarly community that makes neuroscience greater than the sum of its parts by integrating schools, disciplines, and levels of analysis and education to accelerate breakthroughs and benefit society.

VALUES

The process of reflection and deliberation that followed the establishment of the new paradigm for DIBS governance yielded affirmation of five core values: interdisciplinary collaboration, diversity, impact, innovation, and leadership.



STRATEGIC GOALS

BUILDING BRIDGES

STRATEGIC GOAL 1: BUILD BRIDGES THAT FOSTER ENGAGEMENT, INCREASE DIVERSITY, AND PROMOTE INTERDISCIPLINARY LEARNING AND COLLABORATION IN THE BRAIN SCIENCES AT DUKE.

Duke has a strong track record in removing barriers between traditional academic disciplines. We aim to build on this existing strength as it is only through such collaboration that we will achieve our mission of understanding the brain for the benefit of society. The brain is exceedingly complex. Our mission, therefore, requires both deep expertise in specialized sub-disciplines and methods – ranging from molecules and cells to neural circuits to clinical trials –

“I would like to see psychiatry and neurosciences at medical and university levels integrated so we have shared resources and translational collaborations among students and faculty at all levels.”

- Duke postdoctoral fellow

as well as the ability to frame and investigate problems at multiple levels of analysis using a wide range of methods and techniques. Achieving our goal also requires collaboration between scientists and clinicians, patients, policy makers, industry leaders, lawyers, and philosophers, among others. Building these relationships requires rubbing shoulders with each other in seminars, symposia, meetings, and classrooms. DIBS can serve as a central “hub” that intentionally creates opportunities for interdisciplinary learning, listening, and discovering. We seek to dissolve the long-standing tensions among discovery sciences, clinical application, and humanistic interpretation.

We also aim to increase the percentage of women and people from communities that are historically undervalued and underrepresented who are successful in the field of neuroscience at our institution and elsewhere in society⁴. A 2016 Survey of Neuroscience Departments and Programs, conducted by the Society for Neuroscience, found that women represent more than 50% of all neuroscience graduate school trainees but only 30% of tenure-track faculty⁵. The editors of *Nature Neuroscience* recently reported that only 21.5% of submitted manuscripts had a female corresponding author, a percentage roughly comparable to what the journal reported

⁴ Valantine, H. and Collins, F. National Institutes of Health addresses the science of diversity. *Proc Natl Acad Sci*, 2015.

⁵ Survey of Neuroscience Departments and Programs. *Society for Neuroscience* <https://www.sfn.org/news-and-calendar/neuroscience-quarterly/spring-2017/ndp-survey> (2017).

in 2006⁶. The editors also noted that only 18.5% of their reviewers were female, again a percentage roughly comparable to 2006 (16.7%).

“Seminar series, focused topic symposia and web-based postings sponsored by DIBS and its centers provide the entire Duke community with reports and discussions of the latest cutting-edge topics in brain science.”

- Duke Faculty member

Tactics for increasing diversity of the student population and faculty at Duke pervade all four strategic goals. Addressing this challenging issue requires a multi-pronged approach that includes enhancing awareness of implicit bias, implementing intentional recruitment strategies, providing

access to role models and effective mentoring for underrepresented minority students and junior faculty, and exposing children and adolescents to the brain sciences at an early age, among other efforts. These will be described throughout our strategic plan.

OBJECTIVES

The following objectives are designed to achieve our goal of building a diverse interdisciplinary community at Duke:

1. *Create a more inviting space for events, teaching, and collaboration* in the DIBS “Cube” by purchasing exterior signage and neuroscience-oriented art for the interior and addressing the acoustic problems in the multi-purpose room where symposia and lectures are held.
2. Sponsor *seminars and symposia on timely topics of relevance to increasing diversity* in neuroscience and STEM (e.g., the 2018 “Gender and Power Dynamics in Neuroscience” series organized by junior neuroscience faculty and postdocs and supported by DIBS).
3. Encourage and support *academic and social networking opportunities* for women and others who are underrepresented in the neurosciences.
4. Provide staff support and funding for faculty-initiated interdisciplinary *Research Groups*, i.e., groups that are united by a common interest in an area of brain science that is especially suited to interdisciplinary study and co-convened by faculty from different departments. Funding will be provided for seminars, speakers, symposia, retreats, postdoc support, and grant development. Current Research Groups include: the Neurohumanities Research Group (Ranjanna Khanna, convener), the Neuroimmunology and Glia Research Group (Cagla Eroglu and Daniel Saban, conveners), and the Cognitive, Auditory, and Neural Bases of Language and

⁶ Editorial: Promoting diversity in neuroscience. *Nature Neuroscience* **21**, 1 (2017)

Speech Research Group (Elika Bergelson, Greg Cogan, Jenni Groh, and Tobias Overath, co-conveners).

5. Provide staff support and funding for *Interdisciplinary Centers* that are administered through or in collaboration with DIBS. This includes continued support for four existing DIBS Centers: Center for Cognitive Neuroscience, led by Roberto Cabeza and Alison Adcock; Duke Center on Addiction and Behavior Change, led by Ed Levin and Tim Strauman; Duke Center for Interdisciplinary Decision Science, led by Scott Huettel; and the Duke Center for Autism and Brain Development, led by Geraldine Dawson. In addition, we will provide support for a new Center that aligns well with an increased investment in engineering and technology: the Duke Center for Neural Engineering and Neurotechnology, led by Warren Grill. Support for Centers varies in focus, scope, and amount across centers and includes funding for seminars, website and annual report development, symposia, speakers, access to administrative staff for logistical support, and training and research grant development and administration.
6. Host and fund an annual DIBS *Distinguished Speaker Event*, designed to bring together the entire brain sciences community across the Duke campus. The event will be a half- or whole-day event that includes speakers, student posters, and a keynote lecture by a distinguished keynote speaker external to Duke.
7. Host and fund faculty-initiated *interdisciplinary symposia* on timely topics (e.g., 2017 Symposium on “Exercise and the Brain”) with the goal of facilitating ideas and collaboration that would lead to applications for external funding. DIBS will also host the interdisciplinary symposia on Brain Resilience and Repair that are part of the *Translating Duke Health Initiative*, headed by Stephen Lisberger.
8. Host symposia and workshops that bring together faculty who have access to clinical data and biosamples with neuroscientists who have not traditionally engaged in the clinical sciences, with the goal of sparking new collaborations.
9. Provide *pre-award grant development services* to support faculty applying for interdisciplinary grants.
10. *Partner with Institutes and Departments that are outside traditional STEM fields* but relevant to the neurosciences, including Philosophy, Humanities, Arts, Religion, Public Policy and Law. Examples include our partnership with the John Hope Franklin Humanities Institute and funding for the Neurohumanities Research Group (see above), the Summer Seminars in Neuroscience and Philosophy program, and Science and Policy Fellowship. Such partnerships explore topics such as the ethics of artificial intelligence, disabilities rights, neurodiversity, narrative medicine, and the role of the visual and performing arts, among others.
11. Implement the *comprehensive communication plan* developed by Kathy Neal, newly-hired DIBS communications director, with input from the FGC. This plan focuses on the following key objectives: (a) Strengthen DIBS brand within the DIBS community, throughout Duke, and nationally/internationally; (b) Foster engagement with DIBS and among Duke brain sciences

researchers; (c) Promote interdisciplinary research opportunities; (d) Support science education, community, industry and other outreach activities; and (e) Facilitate fund-raising efforts. As outlined in the communication plan, a wide range of tactics will be used to achieve these objectives. These include improved email communication with the DIBS community, updating and expanding the DIBS website, promoting faculty and students on DIBS website, enhanced promotion of DIBS events through a wide range of social and regular media, increased recognition for DIBS awardees, marketing materials for community events and donors, modification of DIBS logo to better leverage Duke's brand, and workshops on communicating with media and other non-academic audiences, among others.

WHAT DOES SUCCESS LOOK LIKE?

The following metrics will be used to measure success in achieving our objectives:

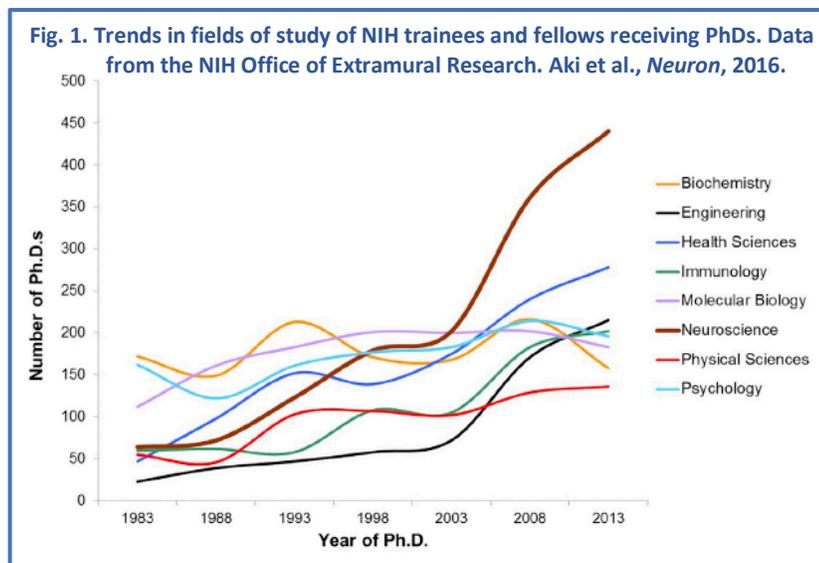
- Level of satisfaction expressed by students and faculty, including females and those from underrepresented minority backgrounds, with level of social support and sense of community with other students and faculty at Duke (via surveys and individual feedback).
- Participation of students, staff, faculty and administration in strategies to reduce implicit and explicit bias (via training activities and surveys).
- Number of interdisciplinary research and/or teaching collaborations initiated.
- FGC evaluation of the contributions and success of the interdisciplinary centers, based on metrics detailed in annual reports and periodic reviews.
- Number of internal and external interdisciplinary research and training grants submitted by and awarded to Duke faculty, postdocs, and students.
- Number of faculty and students attending DIBS-sponsored interdisciplinary activities and events (e.g. symposia).
- Number and types (e.g., op-eds, social media, news media) of impressions highlighting DIBS activities.
- Number of donors funding neuroscience-related activities at Duke.
- Frequency of use of DIBS "Cube" for symposia, networking, learning, and other events.

AN EXCEPTIONAL INTERDISCIPLINARY NEUROSCIENCE EDUCATION

STRATEGIC GOAL 2: PROMOTE EXCEPTIONAL INTERDISCIPLINARY NEUROSCIENCE EDUCATION FOR ALL LEVELS OF LEARNING AND ANALYSIS.

A central priority of DIBS is to inspire our students to see themselves in a neuroscience-related career, and/or to move successfully forward into whatever career they pursue with improved knowledge and understanding of the brain. We are obligated, therefore, to prepare them for what will be a competitive, complex, and diverse set of career pathways. The fact that the number of NIH trainees and fellows receiving PhDs in neuroscience has risen more rapidly than any other field in the biomedical sciences in the U.S. underscores the need for targeted investments in neuroscience graduate education (see Figure 1⁷).

Many factors have led to changes in how we need to approach neuroscience training to best prepare our students for the future⁶. These include (1) the increased number of fields that are now considered an integral part of neuroscience, such as engineering, mathematics, social sciences, law, and the humanities; (2) the rapid development of new technologies and tools for studying the brain; (3) a greater focus on interdisciplinary team-based science; (4) more opportunities for translation and commercialization of neuroscience-related discoveries, requiring knowledge of business, entrepreneurship, and industry; and (5) an increased need for strong communication skills, including the ability to convey information well to the general public, media, and policy makers.



⁷ Akil, H., Balice-Gordon, R., Cardozo, DL, Koroshetz, W., Posey Norris, SM, Sherer, T., Sherman, SM, and Theils, E. Neuroscience training for the 21st Century. *Neuron*, 90, June 1, 2016.

In particular, increased preparation in computational science, applied mathematics, and engineering is needed⁸. Technologies available to study the brain, such as multi-electrode recordings, are generating complex and enormous data sets requiring new skills in data management, visualization, and analysis. Future career success also requires writing, laboratory skills, project management, teaching, and communication skills. Moreover, the percentage of PhD students who are pursuing careers outside traditional academia is increasing as academic positions become more scarce and non-academic careers offer increasingly exciting opportunities for entry-level neuroscientists⁹. Thus, opportunities for networking and internships with industry and other non-academic entities are essential.

There is also need for strategies to integrate students and trainees from different disciplines, given the inherent interdisciplinary nature of the brain sciences. This is where DIBS can play an essential role by promoting cross-fertilization and collaboration across

“DIBS is particularly useful for bringing students into basic or translational labs or clinics to gain valuable practical experience for their career paths.”

- Duke graduate student

departments and disciplines at Duke. By supporting interdisciplinary education, including symposia and seminars and research assistant positions through DIBS Incubator Awards and other programs (e.g., Wrenn Fellowship, Bass Connections in Brain & Society), DIBS offers students and fellows the ability to gain a working knowledge of diverse disciplines, as well as benefit from networking opportunities with students, trainees, and faculty from other departments and laboratories. These experiences often include a translational focus involving basic scientists, clinicians, and industry. This allows the students and trainees to learn the process by which basic science informs the discovery and development of diagnostic and treatment methods for disabling conditions that affect the brain.

As part of the reorganization of DIBS, the Undergraduate Studies in Neuroscience program (which offers BS and AB degrees, a minor in neuroscience, and a certificate in decision science) will now be administered through the Department of Psychology & Neuroscience. DIBS will continue to play an important role in undergraduate neuroscience education (see objectives below); however, this reorganization allows DIBS to focus its efforts on post-baccalaureate education. A new strategic objective for DIBS is a stronger focus on graduate and postdoctoral education, which includes increasing diversity among our graduate students and postdocs and promoting career advancement for women and underrepresented minorities. We aim to strengthen the

⁸ Institute of Medicine (2014). Developing a 21st Century Neuroscience Workforce: Workshop Summary (The National Academies Press).

⁹ <http://www.nsf.gov/statistics/srvydoctoratework/#sd%26tools%26micro%26profiles%26tabs-1>

graduate and postdoctoral neuroscience education experience at Duke by (1) promoting and connecting graduate learners and postdoctoral fellows with opportunities to gain data science skills; (2) fostering supportive and vibrant interdisciplinary trainee-led communities for graduate students and postdocs; (3) providing a variety of venues for networking and collaboration among students and faculty from different disciplines and expertise, including both basic and clinical neuroscience; (4) funding workshops on career development that address the diverse career landscape; (5) seeding interdisciplinary neuroscience research that is team-based and includes learners at all levels (e.g., Bass Connections in Brain & Society); and (6) assisting faculty in applying for graduate and postdoctoral training grants that target interdisciplinary neuroscience training (e.g., NIH, NSF).

OBJECTIVES

The following objectives aim to achieve our goal of providing an exceptional interdisciplinary neuroscience education at Duke:

1. *Increase the diversity of neuroscience graduate students and postdoctoral fellows* through targeted recruitment, mentoring, and networking efforts.
2. Support and help coordinate the *Neuroscience Graduate Consortium* at Duke, which involves an interdisciplinary set of course work, as well as social events, colloquia, retreats, and career development workshops. The consortium will be led by a graduate student leader with a FGC member serving as a liaison (Tobias Egner).
3. Support and administer the *Cognitive Neuroscience Admitting Program (CNAP)*, a unique program that allows neuroscience graduate students to participate in an interdisciplinary educational experience involving multiple departments. A key feature of the program is that after two years of course work and laboratory rotations, students then select a primary department and two advisors who have expertise in different subdisciplines related to their area of interest.
4. Offer the *Certificate in Cognitive Neuroscience*, which 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.
5. Sponsor the annual *Neuroscience Bootcamp*, a two-week immersive lecture, discussion and laboratory course for graduate students in the Neurobiology Graduate Program and the Cognitive Neuroscience Admitting Program; this course is also open to graduate students in allied programs. The Duke *Neuroscience Bootcamp* provides (a) a common knowledge base of neuroscience fundamentals; (b) hands-on experience with techniques that are commonly used to explore cellular/molecular, circuits, systems, and cognitive neuroscience; and (c) an

introduction to a wide variety of Duke faculty and helpful resources for ensuring a successful graduate career.

6. Oversee the *Wrenn Fellowship in Alzheimer's Disease Research*, a three-year graduate fellowship awarded to a Duke PhD student conducting innovative Alzheimer's disease research.
7. Enhance our communication and advising efforts with graduate students and postdoctoral fellows to ensure that they are able to take full advantage of a wide range of *educational opportunities related to data science* offered at Duke, such as the Masters in Interdisciplinary Data Science and Certificate in Data Science, among others. David Carlson, Assistant Professor of Civil and Environmental Engineering and Biostatistics and Bioinformatics, will be curating all data science-related courses and workshops offered at Duke, and this information will be provided on the DIBS website and via email to a dedicated graduate student/postdoc listserv.
8. Ensure that our graduate students are aware of a *wide range of innovative interdisciplinary training experiences* at Duke, such as (a) Duke Interdisciplinary Graduate Networks (D-SIGN) Grants, which encourage graduate student groups to propose interdisciplinary projects; (b) Graduate Student Training Enhancement Grants, which allow students to propose an experience outside or within their discipline, such as an internship or field work, to enhance their training; (c) the new graduate certificate offered by the Innovation & Entrepreneurship Initiative; and (d) summer courses and other opportunities offered to graduate students in leadership, project management, science communication, and other skills that are important for career success.
9. Prepare graduate learners and postdoctoral fellows with *competencies that facilitate translational applications*, including immersive experiences in clinical settings within our own health system and in industry settings outside of Duke. Information will be provided via email and our website about opportunities to network with industry executives, Duke-sponsored events with industry leaders, and external internships and partnerships in industry.
10. Fund and help coordinate a *Postdoctoral Neuroscience Consortium* to provide a stronger sense of community and opportunity for networking and collaboration among postdoctoral fellows interested in the brain sciences at Duke. This newly-formed consortium will be led by a postdoctoral fellow and three faculty members, Nicole Schramm-Sapota, Leonard White, and Katherine Dickerson.
11. Continue DIBS faculty members' role in *undergraduate and graduate medical school education*, including the MS1 Brain and Behavior Course and Human Brain Anatomy short-courses for PGY1-4 residents in Neurology and Psychiatry, led by Leonard White.
12. Provide leadership for the *Bass Connections in Brain & Society* theme by engaging new undergraduates, graduate students, postdoctoral fellows, and faculty from different disciplines in the Bass Connections program.
13. Continue to facilitate the success of the *massive open online courses* (MOOCs) created and

taught by several members of the DIBS faculty network.

14. Provide funding for a wide range of *interdisciplinary educational symposia and workshops*, such as the Summer Seminars in Neuroscience and Philosophy (led by Walter Sinnott-Armstrong and Felipe De Brigard) and Summer School in Social Neuroscience and Neuroeconomics (led by Greg Samanez-Larkin).
15. Connect Duke undergraduate neuroscience students with opportunities for interdisciplinary research through the *Summer Neuroscience Program*, which provides an interdisciplinary lab experience and career development workshops for undergraduate neuroscience majors. This is a collaborative effort with the Trinity College of Arts and Sciences, with majority support from the Trinity Research Enhancement fund.
16. Offer comprehensive information about *undergraduate neuroscience major and minor* at Duke on the DIBS website.
17. Through philanthropic efforts and training grants, increase the available *funding for training fellowships* for graduate students and postdoctoral fellows in the brain sciences at Duke. This includes seeking opportunities for Duke students and trainees to “tell their story” about their educational experience at Duke and how it has affected their career trajectory.

WHAT DOES SUCCESS LOOK LIKE?

The following metrics will be used to measure success in achieving our objectives:

- Number and quality of neuroscience graduate students and postdocs applying at Duke.
- Percentage of neuroscience graduate students and postdoctoral fellows who are female and from underrepresented minority backgrounds who enter training and succeed in moving on to their next career step.
- Satisfaction by neuroscience graduate students and postdocs with internal community and social support, as well as mentoring and career development opportunities.
- Percentage of neuroscience graduate students and postdocs who are successful in achieving their subsequent career goals after graduation from their program.
- Level of learner success and the reach/impact of the MOOC neuroscience-related courses measured via analytics provided by Coursera and Duke Learning Innovations.
- Number of undergraduates participating in the Summer Neuroscience Program and corollary results of this participation, such as publications, recognitions, awards, and Graduate with Distinction in Neuroscience honors.
- Number of new undergraduates, graduate students, and postdocs participating in Bass Connections in Brain & Society and corollary results of this participation, such as publications, awards, and grants applied for and awarded.
- Number and amount of philanthropic and grant funding for fellowships and graduate/postdoctoral training programs at Duke.

FORMULA FOR TRANSFORMATIVE DISCOVERIES

STRATEGIC GOAL 3: CATALYZE INTERDISCIPLINARY NEUROSCIENCE RESEARCH TO TRANSFORM OUR UNDERSTANDING OF BRAIN FUNCTION AND TO USE NEUROSCIENCE TO BENEFIT SOCIETY

A multi-pronged approach will be used to achieve our goal of catalyzing cutting-edge interdisciplinary neuroscience research at Duke. First, DIBS plays an important role in providing opportunities for scientists across Duke to network, build relationships, and think creatively together. This was described above under Strategic Goal 1. Second, DIBS will help ensure that Duke remains at the forefront in providing their scientists with the highest quality tools, technologies, and data analytic platforms and methods related to brain science, ranging from tools for studying molecular pathways to cloud-computing infrastructure needed for big data analysis. We will provide leadership in identifying future trends in neuroscience research and current gaps in our research infrastructure at Duke that should be addressed, as well as solutions for addressing those gaps. This is critical for our faculty to be successful in obtaining NIH and other sources of external research and training funding, such as the NIH Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative. Third, DIBS will offer seed research funding that allows scientists from different departments and disciplines to conduct innovative science that has the potential to lead to new discoveries, ranging from the development of new techniques for measuring brain function to identification of new potential treatments for those suffering from brain disorders. Fourth, we will provide administrative support for faculty applying for external interdisciplinary neuroscience research grants so that our investments in seed funding can turn into robust new programs of research at Duke. Fifth, we will prioritize existing and emerging areas of strength at Duke, including the following: neuroengineering and neurotechnology, computational neuroscience, neuroimmunology, translational neuroscience (neurodegenerative diseases, autism, addiction, epilepsy, stress, and pain), philosophy and

“We need to prioritize high-quality data, especially, we need to ensure that the equipment used to provide data to researchers is cutting-edge.”

- Duke Faculty Member

neuroscience, and decision sciences, including neuroeconomics. Our efforts will be designed to be synergistic with other related initiatives at Duke, including the Information Initiative at Duke ([iiD](#)), [MedEx](#), and the neuroscience pillar of the Translating Duke Health Initiative, among others.

A key priority, identified by the broader Duke faculty and the FGC, will be investing in improving Duke’s human and animal neuroimaging capabilities, including making improvements in space, equipment, training, and technical support. The DIBS FGC has created a Neuroimaging

Subcommittee, led by Alison Adcock and Scott Huettel, which includes other members of the FGC and Moira Rynn, Chair, Department of Psychiatry and Behavioral Sciences. Allen Song, Director, Duke Brain Imaging and Analysis Center, and Raj Morey, Neuroimaging Core Director, Durham Veterans Administration, are also contributing significantly to this effort. This committee will work with other key stakeholders at Duke to provide leadership in developing and implementing a phased approach to creating state-of-the-science neuroimaging resources for scientists at Duke.

Based on its past success, we will expand DIBS signature internal research funding program, DIBS Incubator Awards. These one-year awards of up to \$100,000 provide seed funding to support interdisciplinary brain science research for research of exceptional innovation. Projects require at least two faculty representing multiple fields or levels of analysis. Priority is given to projects that involve investigators from multiple schools (School of Medicine, Arts and Sciences, Pratt School of Engineering, etc.). Based on feedback we received during the Town Hall meetings, we will also launch a new funding mechanism to support smaller, targeted requests for training, pilot data, salary and/or equipment that would facilitate a new program of research and enhance chances of obtaining external funding (DIBS “Germinator Awards”). These awards would be up to \$25,000 for one year. We have streamlined and standardized the application process and established an award tracking survey to systematically measure outcomes and return-on-investment. We have also established a precedent to leverage external donors for these awards.

OBJECTIVES

1. Provide *pre-award grant application development support* to Duke faculty applying for larger, interdisciplinary applications for external funding, including training grants.
2. Establish a Neuroimaging Subcommittee of the FGC, chaired by Alison Adcock, Department of Psychiatry and Behavioral Sciences, and Scott Huettel, Department of Psychology & Neuroscience, to develop a comprehensive, phased short- and long-term plan for *enhancing human and animal MR imaging resources* at Duke that addresses space, equipment, training, and technical support.
3. Hire an *MRI specialist* to support faculty across the Duke campus in conducting high-quality, cutting-edge, human functional neuroimaging research at Duke. The MRI Specialist will report to the FGC Neuroimaging Subcommittee and the DIBS COO and interact closely with leadership and staff at the Brain Imaging and Analysis Center, investigators, and medical school departments to enhance neuroimaging research by optimizing MR imaging protocols, acquisitions and analyses.
4. Collaborate on Duke initiatives that are aimed at ensuring that optimal cloud-based data storage and computing infrastructure are readily available to Duke neuroscientists.

5. Expand the *DIBS Incubator Awards* to increase opportunities for faculty, students, and postdocs at Duke to initiate novel high-risk interdisciplinary neuroscience research and gather necessary data to support applications for external research funding.
6. Launch the *DIBS Germinator Awards* to support smaller, targeted requests for training, pilot data, salary and/or equipment that would facilitate new research and lead to new external funding.
7. Partner with the Duke Development office to *increase the number of philanthropic gifts to support neuroscience research* and to steward the gifts of generous donors who are already providing such funding. This will include improving our ability to communicate what we do and why it is important and seeking new opportunities for faculty and students to meet with prospective donors.

WHAT DOES SUCCESS LOOK LIKE?

The following metrics will be used to measure success in achieving our objectives:

- Number of external interdisciplinary research and training grants applied for and awarded.
- Degree of faculty, postdoctoral fellow, and graduate student satisfaction with animal and human MRI resources, as reflected in user surveys, recruitment and retention numbers, quality of data, and success in receiving funding for research projects utilizing MRI.
- Degree of faculty satisfaction with cloud-based data storage and computing infrastructure at Duke.
- Number of new interdisciplinary collaborations facilitated through the DIBS Incubator and Germinator Awards.
- Number of DIBS Incubator and Germinator Awards leading to grant applications, grant awards, publications, media and other external coverage and recognition.
- Number and amount of philanthropic donations directed toward neuroscience research at Duke.

BEYOND THE DUKE CAMPUS

STRATEGIC GOAL 4: PARTNER WITH A WIDE RANGE OF COMMUNITY STAKEHOLDERS TO INCREASE THE IMPACT OF INTERDISCIPLINARY BRAIN SCIENCE.

The positive impact of efforts on the local Durham community and across the globe will be largely determined by our relationships with a wide range of community partners, including patients, research participants, educators, policy makers, and industry and government leaders, among others. In Durham, Duke is embedded in a geographic and cultural context that can enrich our science and increase the impact of the work we do. Partnership with our local community implies a dynamic, two-way communication between scientists and the public. Thus, we will support a range of activities that will allow us to communicate scientific findings in a meaningful way that leads to action and informs our research focus and approach.

Outreach activities will support our goal of increasing diversity among neuroscientists by exposing students from diverse socioeconomic and racial/ethnic minority backgrounds to neuroscience at a young age, demystifying brain science, and providing role models for young people. Such activities will also provide faculty, students and trainees opportunities to learn how to effectively communicate with a wide range of stakeholders, a skill that is increasingly recognized as important for success in the field of neuroscience. Outreach will involve a wide range of activities, including creating venues for communication and relationship-building, such as awareness events, public seminars, lectures in K-12 settings and facilitating faculty and student participation in op-eds, blogs, and other social and regular media outlets.

“DIBS should continue investing in community outreach. I volunteered last year for the event in the Cube during Duke's Brain Awareness Week, and it was very rewarding.”

- Duke Faculty Member

As we learn more about how to promote brain health and how to thrive in the face of challenging conditions that affect the brain, we have an obligation to communicate this information to the local and broader community.

OBJECTIVES

1. Host an *annual DIBS Discovery Day* to offer a family-friendly environment to learn about how brain science is used to address our most pressing public health challenges and promote brain health.

2. Facilitate student and faculty participation in North Carolina public school's *K-12 outreach program* by offering lectures about the brain to students of all ages.
3. *Partner with the N.C. Museum of Natural Sciences (Raleigh) and the N.C. Museum of Life and Science (Durham)* to host events and activities that engage children and the general public in the brain sciences.
4. Continue to facilitate the success of the *massive open online courses (MOOCs)* created and taught by several members of the DIBS faculty network, allowing us to reach approximately 100,000 people worldwide annually with information related to the brain sciences and our mission.
5. Co-host an *annual Autism Awareness Month event* with the Duke Center for Autism and Brain Development to celebrate neurodiversity and increase knowledge and acceptance about autism and other developmental disabilities both within and outside of Duke.
6. *Enhance our ability to communicate* with the broader community, including information related to promoting brain health, through strategies outlined in our Communication Plan (see above) and via workshops on communication and a wide range of media.

WHAT DOES SUCCESS LOOK LIKE?

The following metrics will be used to measure success in achieving our objectives:

- Number of persons from the community participating in DIBS Discovery Day.
- Number of children and adolescents exposed to brain sciences through K-12 outreach.
- Number of individuals attending DIBS-sponsored lectures at the N.C. Museum of Natural Sciences and the N.C. Museum of Life and Science.
- Number of persons attending the annual Autism Awareness event on neurodiversity.
- Number of students, trainees, and faculty attending the DIBS-sponsored workshop on communication and media training.
- Number of persons enrolled in the MOOC neuroscience-related courses measured via analytics provided by Coursera and Duke Learning Innovations.
- Number of student, trainee, and faculty-writing op-eds, blogs, and other materials that reach the general public, including being quoted in the media.
- Number of media impressions that are designed to reach key audiences such as graduate students and postdocs, faculty, Duke leadership, and community members interested in brain science.

CONCLUSION

We conclude by noting that the DIBS Strategic Plan, “*Blueprint for Advancing Neuroscience at Duke*”, is intended to be a living document that will be reviewed regularly by the FGC and updated to reflect new and emerging priorities. Given the rapid advancements being made in neuroscience and the dynamic nature of academic communities, we acknowledge that frequent updating of this plan will be essential. Our commitment is to remain relevant and strategic in targeting our investments to the maximum benefit of the DIBS community and the people and communities we serve.

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