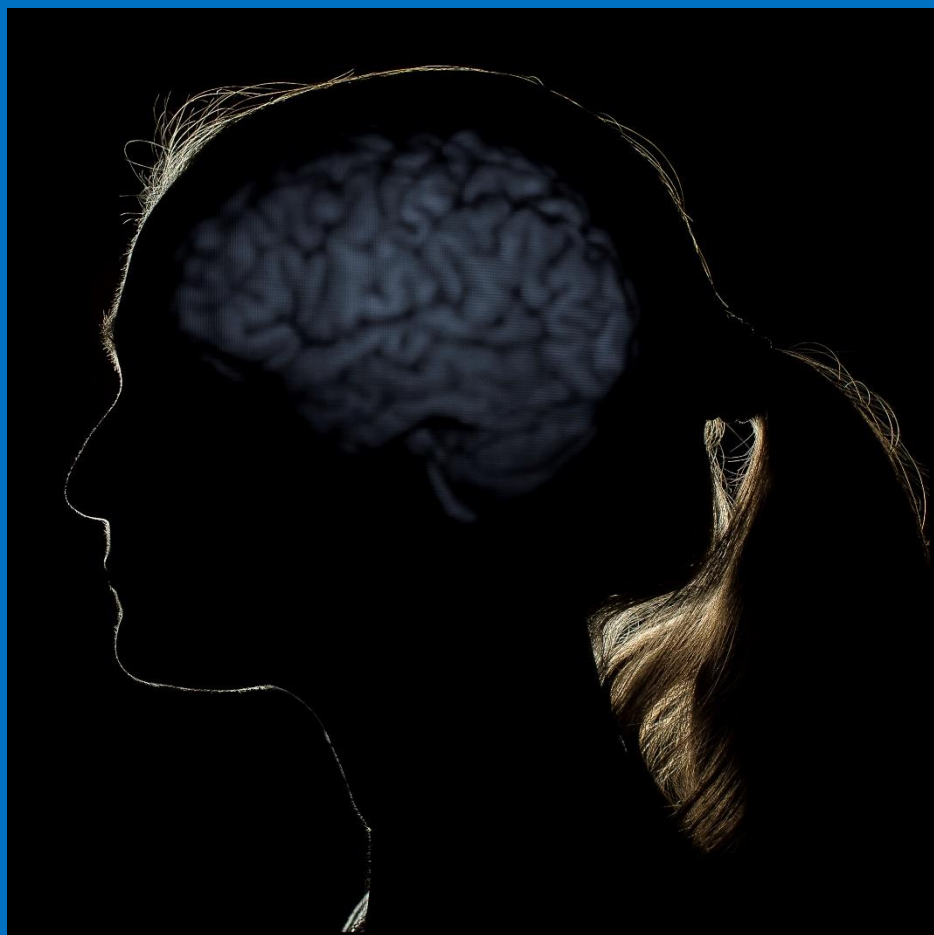


Impact Report

FY 2023-2024



Contents

A message from our Interim Director	2
Our mission, goals and vision	3
Accomplishments - 2023 -2024	4
FMRI Research Facility	4
Impact Neuroscience Program (Graduate student training)	5
Brain Portal: Multimedia Displays for Duke Brain Science	5
Creation of a new Bass Connections team for the Brain Portal	8
Neuroscience Teaching Lab	9
Cognitive Neuroscience Research Internship (CNRI)	12
Duke University Neuroscience Experience (DUNE)	13
Growing awareness and engagement to expand our community	13
1) Increased visits and utilization of the Cube	14
2) Promoted Duke Brain Science in media stories	15
3) Redesigned our website to better communicate what we do and why	15
4) Introduced Duke Brain Science to alumni in their hometown.....	16
Our generous supporters.....	17
Resources	18

A message from our Interim Director

I tell my students that uncertainty makes innovation happen. This has been a year full of both. It highlighted a need to publicize how brain science can help you even if you're not a patient or a brain health clinician. It also made clear an opportunity for scientists to communicate how the tools of science benefit our lives and mental health.

It's obvious that brain science is relevant for brain health, but brain science is also key to making progress on the most pressing challenges facing humans, because they all arise from human behavior. It's important to say: Scientists don't need brain data to predict behavior. They can do that knowing only past behavior, which is also enough to shape average behavior of a group. But in order to change individual behavior, we need to understand its brain mechanisms. The state of brain science today offers many insights that can empower solutions, nurture compassion, and inspire hope.

Here at Duke, we have the opportunities to do science impossible at any other place, and to use our science for broad impact. Duke is a world renowned university with unparalleled resources, and the richest one may be our people. Duke's core values of respect, trust, inclusion, discovery, and excellence lead naturally to our tradition of deep respect for the agency and potential of our students. We are uniquely committed to overcoming barriers, supporting students, and empowering them to lead. This culture and commitment to using our work for individual flourishing and societal impact attract stellar students and colleagues, whose innovation and dedication change lives -- including our own.

Long before we achieve cures and discoveries, our science is a force for good. Science is a practice, available to everyone, to help us navigate an uncertain world. It helps us know how to ask answerable questions and counter our biases. It teaches us how to quantify uncertainty, so we can act decisively while acknowledging what we don't know. It offers access to awe at the majesty of nature and inspiration at human achievement. Guided and inspired by discoveries made here at Duke, including by my own lab, the research training programs at DIBS support our students so they can reap the benefits of practicing science. In this setting of passionate dedication, science equips students for resilience to uncertainty in directing their own futures and improving the lives of others. These are experiences that shape lifelong values, launch students into unforeseen trajectories, and promote individual and cultural investments in science.

Brain science is special because it is the biology of us. DIBS is a way to make it for us. In pursuit of that goal, in 2024, we began the design phase for a proposed Center for Mind and Brain Imaging MRI center on Flowers Drive, adjacent to Duke Gardens. This Center is a major milestone. It will literally welcome the world to neuroscience at Duke. It will expand access to human neuroscience to students of all levels, elevate training opportunities, and welcome a wider range of research participants.

With the Flowers Drive MRI center inviting the world to explore Duke neuroscience, the DIBS Cube can be fully deployed as a symbolic center of the science and education dispersed across Duke. The Cube already hosts students from across campus. It has incubated myriad new programs to attract additional funding and support, including the Neuroscience Major and the Neuroscience Teaching Labs, now in development. The Brain Portal project and its Bass Connections team, also awarded in 2024, are creating digital models and imagery to manifest our brain sciences on specialized video displays in the Cube and across campus. With our science visible from anywhere in the landscape at Duke, we can attract the brightest minds from every field to gain access to the wonder of the brain and take part in creating science and art. At Duke, we have all the pieces we need to attract the scholars, the funders, and the public to our work, bringing us closer to fully realizing its enormous potential. There is no better place than Duke, and no better time than now to make brain science truly for everyone.



R. Alison Adcock, M.D., Ph.D.

Our mission, vision, and goals

The Duke Institute for Brain Sciences is a hub for neuroscience research, education and community engagement, drawing people to brain science, connecting them to each other, and sharing their work to help our world flourish.

Our mission

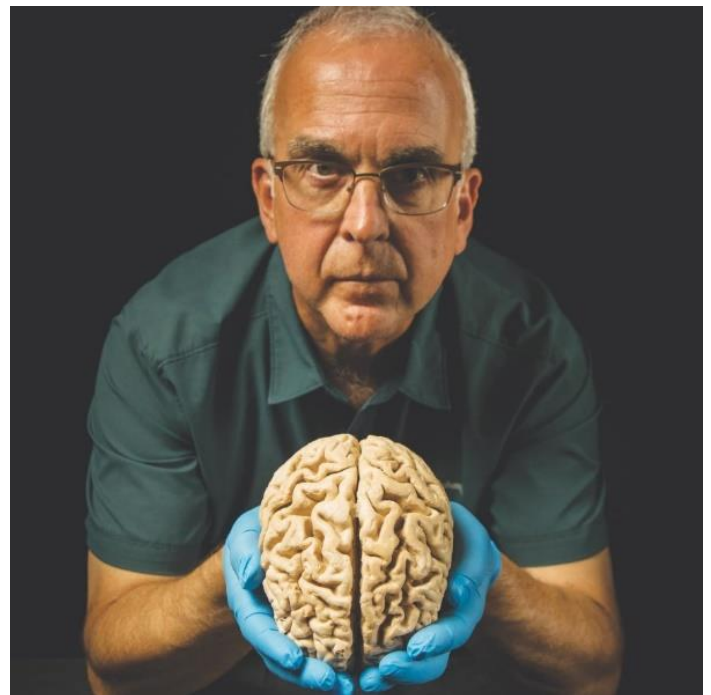
The mission of DIBS is to promote interdisciplinary brain science and translate discoveries into solutions for health and society.

Our 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.

Our goals

- **Building bridges.** Unify dispersed scholars at Duke by manifesting their work and integrating their needs. Harmonize infrastructure and create communities of practice across Departments and Schools
- **Exceptional interdisciplinary neuroscience education.** Attract, inspire, and educate the next generation of scholars and leaders. Equip our students to navigate uncertainty with curiosity, innovation, and joy via transformative research experiences.
- **Catalyze interdisciplinary research.** Connect and collide faculty and students for collaboration. Position them for innovation and translation of knowledge about the brain for discoveries and solutions.
- **Impact beyond Duke** Synergize engagement and outreach to increase funding, advocacy, and partnerships. Share knowledge to promote brain literacy in support of enlightened policy and human flourishing.



Accomplishments - 2023 -2024

FMRI Research Facility

A center for studying the biology of the mind with Magnetic Resonance Imaging (MRI) is the most important modern technology for human brain research, connecting it to all the rest of neuroscience. Duke faculty were pioneers in the use of MRI to study brain function, letting us decode the contents of thoughts and feelings from patterns of activity. Our faculty literally wrote the book -- the first methods textbook on functional MRI. The horizon of new methods for using MRI is rapidly expanding, promising an ever more complete picture of the biological mechanisms that make our minds.

This year, we developed a university-wide proposal and gained approval to develop a new cognitive neuroimaging research facility that will expand Duke's research capabilities, accelerate breakthroughs, and permit transformative experiences for students. In an accessible location on Flowers Drive (across from beautiful Duke Gardens), it will welcome the full range of potential participants and researchers from across Duke and beyond. This facility will create an inviting space for participation in brain science by diverse people, including many who have been historically disenfranchised from biomedical research. With it we can:

- Accommodate infants, children, autistic patients, and those who can't tolerate noisy settings
- Fully sample human development over the lifespan
- Offer advanced technological training for researchers
- Enable faculty to mentor transformative research experiences for undergraduates and incorporate state-of-the-science neuroimaging into educational experiences

These advantages will position Duke's MRI research centers to lead the nation in MRI neuroimaging innovation, strengthening our ability to attract collaborative grants, and stellar colleagues and students, elevating not just those who directly depend on MRI but all of Duke's brain science community.

We are grateful to our External Advisory Board whose support and advocacy were instrumental in getting this center approved. In 2024-2025, our major strategic priority will be to gain financial support from donors. These gifts will help finance the construction of the facility and the equipment needed.



Impact Neuroscience Program (Graduate student training)

Funded by the National Institute of Mental Health for graduate training in the neurosciences at Duke, PIs Alison Adcock, Ph.D. and Greg Samanez-Larkin, Ph.D., drew on their expertise in motivated learning, resilience, and well-being to identify conditions that optimize learning and cognitive performance. The program foundation, application process and advisory board was established, and the first cohort of fellows were selected in the summer of 2024. The program launched in the fall of 2024. During the year, the fellows will:

- Participate in regular gatherings designed to build community, promote mental wellness, explore career opportunities, develop skills in mentorship, and protect time for imagination.
- Have opportunities to mentor younger students in the brain sciences.
- Participate in data science or other computational skill building opportunities, and receive support to match training opportunities to the fellow's research needs.
- Receive support to engage with activities that promote mental wellness.
- Have access to funds to support travel and summer stipends.
- Develop and regularly update a detailed career plan to prepare them for a wide range of careers inside and outside academia.

Impact Neuroscience Program 2024-2045 Fellows



Trevor Alston
Neurobiology
6th year



Lucas Bellaiche
Psychology & Neuroscience
4th year



Paris Brown
Biomedical Engineering
1st year



Antony Brayan Campos Salazar
Neurobiology
4th year



Kennedy Coates
Neurobiology
3rd year



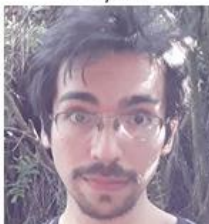
Samantha Deasy
Neurobiology
1st year



Cortney Howard
Psychology & Neuroscience
6th year



Madison Monroe-Mohajerin
CNAP
1st year



Ricardo Morales-Torres
Psychology & Neuroscience
4th year



Jaime Ali Rios
Psychology & Neuroscience
1st year



Jade Terry
Psychology & Neuroscience
3rd year



Leslie Vazquez-Rangel
Neurobiology
3rd year

Brain Portal: Multimedia Displays for Duke Brain Science

The human brain is the most complex object in the known universe. Yet, its beauty is mostly hidden from those outside the neuroscience community. The Brain Portal will make the beauty of the brain and Neuroscience research at Duke visible to all.

The Portal will ignite passion in multiple audiences:

- **Visitors who are not Neuroscientists** will be able to explore and experience the brain for the first time in an interactive and immersive way.
- **Students will gain the enriched learning experience** by being able to be immersed in research data in brand new ways.
- **Duke Neuroscientists** will experience their own research in completely new ways, providing insights and new perspectives which will drive creativity and innovations.
- **Faculty and researchers from all fields** will be inspired with the new insight which can lead to increased collaboration and innovation with their peer experts.

We are motivated by the curiosity that open labs evoke, from sawdust smells of the exhibit shops at Exploratorium, the world's first interactive science museum, to Pratt's POD Labs at the LSRC, where passers-by can't help but see and be intrigued by the active work of engineers and learners as they design and build

While the signature space for neuroscience at Duke is underground (home of the Duke Institute for Brain Sciences), we have the benefit of an iconic entrance—a striking glass cube on the LSRC plaza – with long views extending toward Research Drive and the Medical Center beyond. The Cube glass walls will be transformed by this project with large, bright visual displays inviting the Duke community to enter.

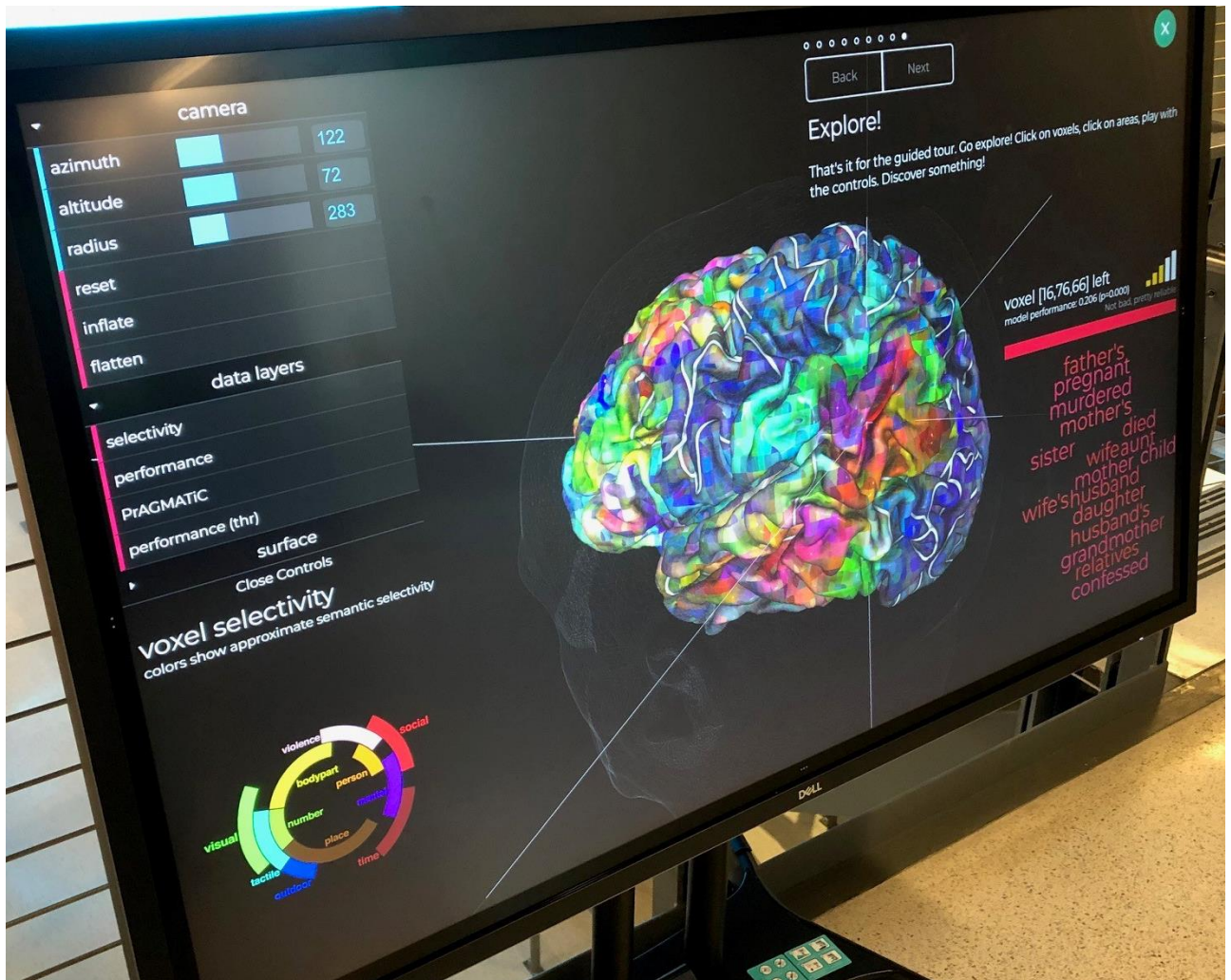
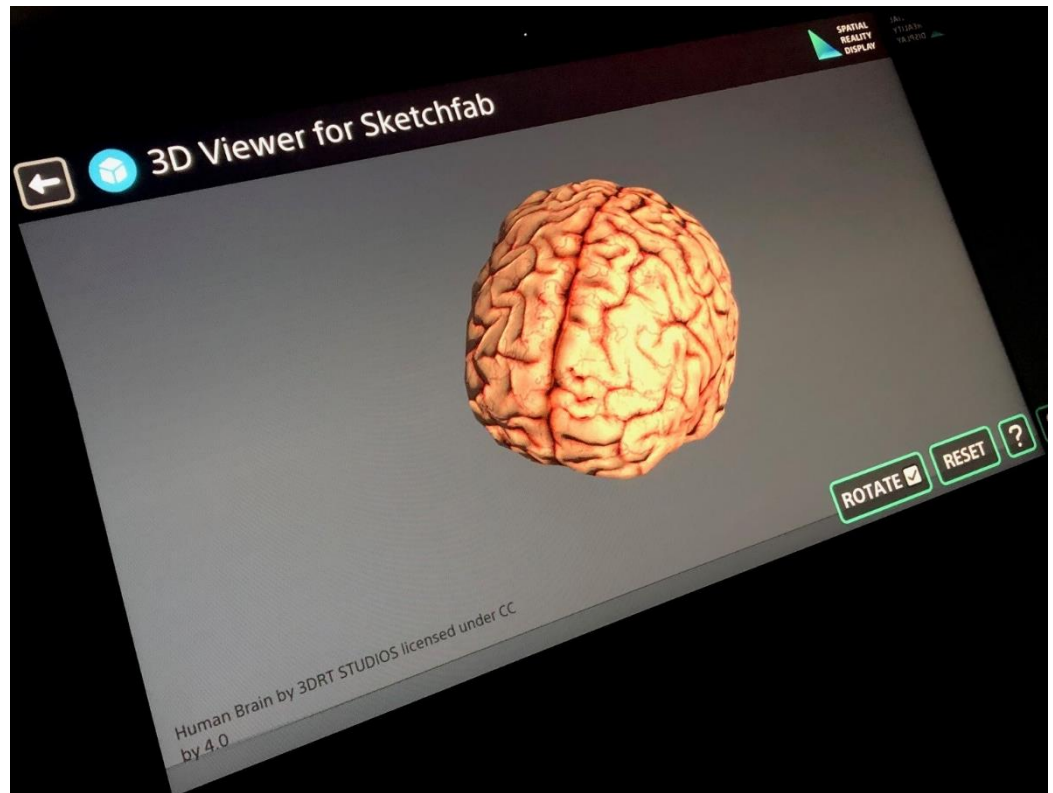
Using cutting edge semi-transparent LED technology to wrap the sides of the Cube, largescale visualizations including 3D effects will increase the visibility and accessibility of neuroscience at Duke. The immersive display will emit vibrant colors and huge high-resolution images, captivating with their depth, and movement.



The Duke Institute for Brain Science's Cube, with brain imaging mockup added by Bass Connections Team Leader, Augustus Wendell, Arts & Sciences-Art, Art History, and Visual Studies

Brain Portal displays inside the Cube

The Brain Portal displays inside the Cube will encourage visitors to immerse themselves in the shapes and functions of the brain. The Neuroscience Teaching Lab described later in this report will take center stage in this interactive environment.



Creation of a new Bass Connections team for the Brain Portal

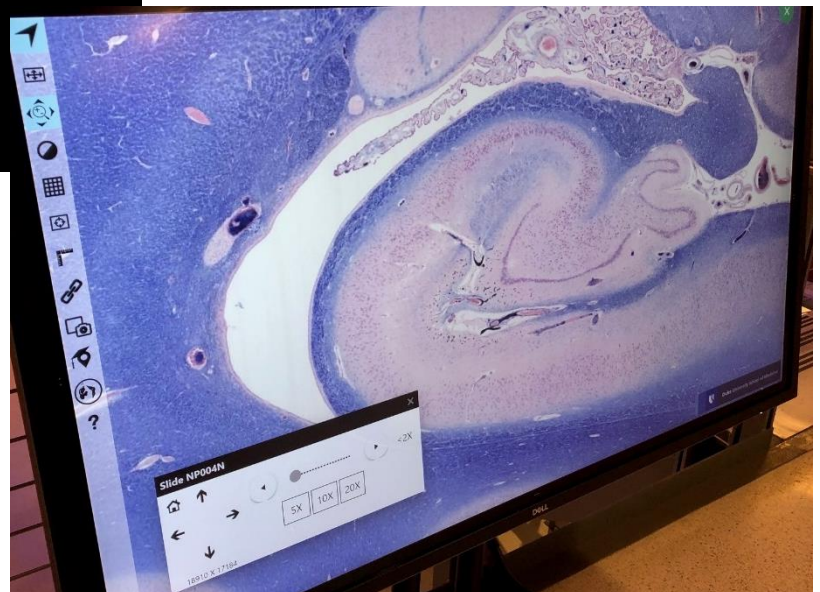
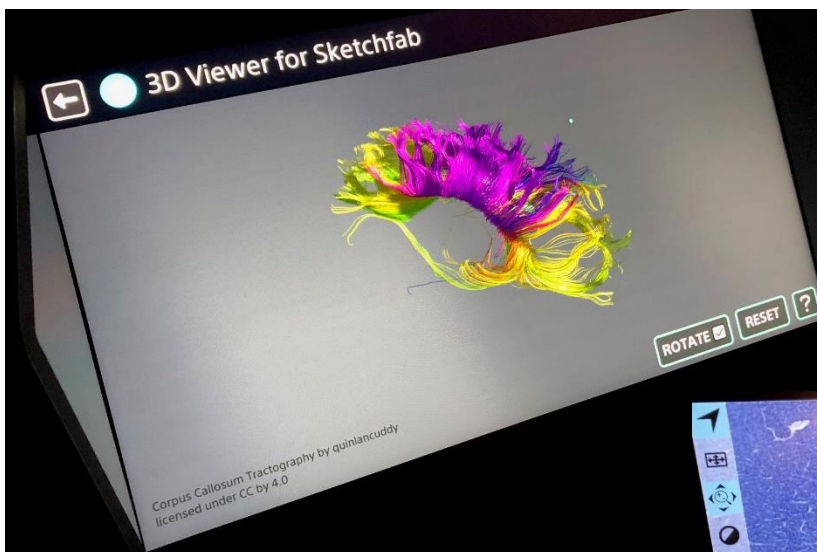
To launch the Brain Portal, a new Bass Connections team, "[Brain Portal: Designing Multimedia Displays for Duke Neuroscience](#)" has been created as a part of the Brain & Society interdisciplinary theme.

The team will leverage emerging data and media technologies to visualize brain science and enable exploration through creative works. We have acquired novel display devices including large-format, multi-touch screens for self-guided inquiry and as well as tabletop spatial reality displays for headset-free stereoscopic viewing of digital objects.

Technically, we will gather and curate digital assets from the brain science community at Duke. The Bass team will design and format multi-media visualizations that are optimized for each display. From a humanistic perspective, we will strive to move the minds, emotions, and bodies of passers-by who encounter the brain by happenstance and learners intentionally pursuing neuroscience discovery within the Cube. Further, we aim for the Brain Portal to be transformative for those creating these works as we showcase the beauty and awe of their own discoveries and insights.

Future work will include collaborations with artists educated in brain sciences who may design exhibitions for display at the Cube, LSRC, and at the Nasher Museum of Art.

The Brain Portal has been funded through a generous gift from the Ostrow family to the Duke Institute for Brain Sciences and the Nasher Museum of Art.



Neuroscience Teaching Lab

[DIBS Cube at the LSRC, lower level]

The Duke Neuroscience major offers a wide range of courses designed to encourage exploration in the brain sciences at three levels of analysis:

1. Molecular and cellular
2. Circuits and systems
3. Behavior (which includes human cognition)

While our curriculum is designed to engage students and encourage faculty-mentored research, we have long recognized the need to inspire our students with hands-on laboratory experiences and course-based research opportunities. Now, with the generous support of several families who share our passion for engaging students in the brain and cognitive sciences, we are developing a Neuroscience Teaching Lab to enrich active learning and discovery in the undergraduate Neuroscience curriculum.



Students in NEUROSCI 223 Cellular and Molecular Neurobiology record nerve impulses from an insect leg.

Recent developments:

- Under the direction of Kevin LaBar (Associate Chair, Department of Psychology and Neuroscience), we formed an oversight and steering committee of faculty who are invested in teaching early-career students in lab/methods courses. The committee identified human brain anatomy and cognitive neuroscience as strategic priorities.

- Len White, Director of Undergraduate Studies of Neuroscience, applied for and received a Summer Course Development Grant to redesign a required course in the curriculum, NEUROSCI 217D Introduction to Cognitive Neuroscience, in order to incorporate laboratory based active learning experiences.
- Anna Smith, the doctoral student supported by the grant, worked closely with faculty to identify impact opportunity and prepare new active learning modules for NEUROSCI 217D and other foundational courses. We identified and purchased necessary equipment and supplies, including 25 headband devices for recording electroencephalography (EEG) and electro-oculography (EOG); two 14-channel mobile EEG devices; 11 Spikerboxes for recording nerve impulses in insect legs; 8 light boxes for inspection of histological slides; fluorescence microscope and digital imaging components; and 25 MacBooks with tailored software and a rolling storage/power cart.
- In the Fall 2023, collaborating faculty and their TAs piloted four new active-learning modules in three early-career courses: (1) hands-on, active exploration of human brain anatomy; (2) measurements and analyses of EEG and EOG activity; (3) a series of computer-assisted cognitive tests; and (4) electrophysiological recordings of peripheral nerves in an invertebrate system.
- To record the impacts of these piloted activities, we collected data from end-of-term course evaluations and digital media from several laboratory activities. **Many students reported a positive experience.** They discussed how the activities exposed them to a wide range of techniques in neuroscience, solidified their knowledge of course material, and helped them relate course content to research opportunities on campus. A total of 250 undergraduates engaged with the Neuroscience Teaching Lab in Fall 2023.
- In addition to these new pilot modules: we enhanced two existing lab courses: a “gene-to-behavior” course based on fruit fly models, and a human brain anatomy course. We upgraded a fluorescent microscope system, which now enables students to follow their experimental work to completion. They saw for themselves the results of their work in the brain circuits of the flies, documenting their findings through the acquisition of digital photomicrographs. For our human brain course, we purchased two large-format, multi-touch screens on motorized mounting racks for vertical or horizontal configurations. These devices are ideal for displaying and interacting with virtual brain models and digital atlases of human neuroanatomy. The devices are available for a variety of applications across multiple courses.
- To provide additional support to instructors and teaching assistants, and to broaden the impacts of our efforts going forward, we hired a full-time Lab Manager. This is a new staff position in the Department of Psychology and Neuroscience, with 100% effort toward the development, administration, and oversight of the Neuroscience Teaching Lab.

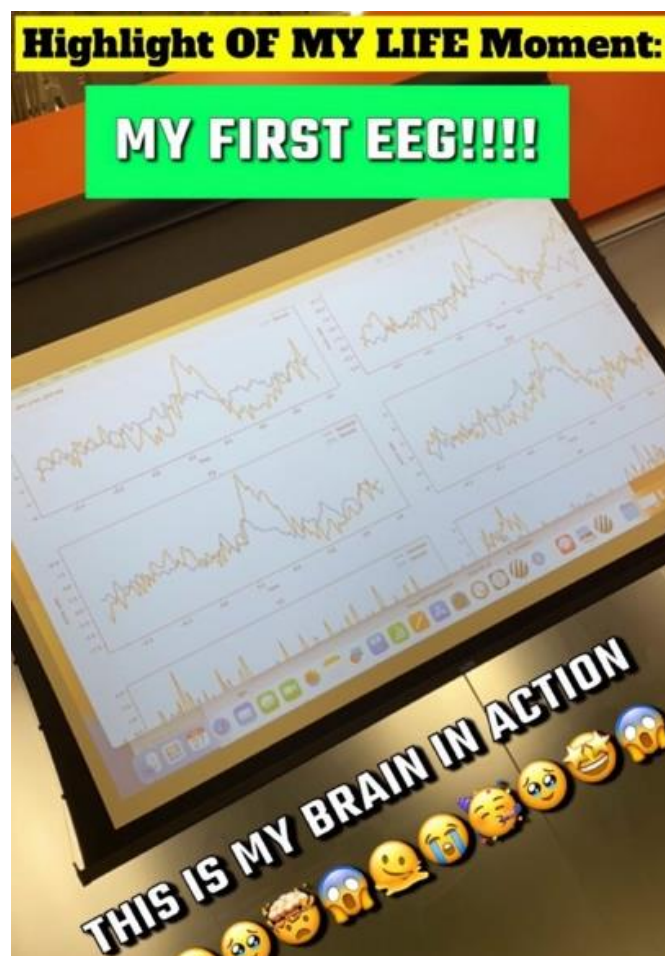
The Duke Institute for Brain Sciences would like to thank Mike and Jennifer Shannon, parents of Sara Rose Shannon '23, for their generous gift of \$1 million to Duke's Neuroscience program. Their gift makes the upgrades for our new Neuroscience Lab possible.

Student passions ignited with hands-on experiential learning



Students in NEUROSCI 380L Functional Neuroanatomy exam human brain specimens in the Neuroscience Teaching Lab.

Social media post by a student in NEUROSCI 217D Introduction to Cognitive Neuroscience after recording his own brain waves “in action”



Cognitive Neuroscience Research Internship (CNRI)

The Cognitive Neuroscience Research Internship program was created by Duke Neuroscience PhD students to provide **Duke Undergraduates** who have not had the privilege of working in a research lab to gain their first invaluable research experience.

CNRI admitted 14 (out of 60 applicants) first generation and/or unrepresented in STEM Undergraduate students with no previous research experience as research interns during the Fall 2023 and Spring 2024 semesters. This transformational program for Duke Undergraduates has graduated 58 CNRI students since its inception in the fall of 2020.

In addition to an invaluable research experience, the Undergraduate interns gained:

- Guided mentorship
- Professional skills development (e.g. Python programming)
- Camaraderie from their peer cohort

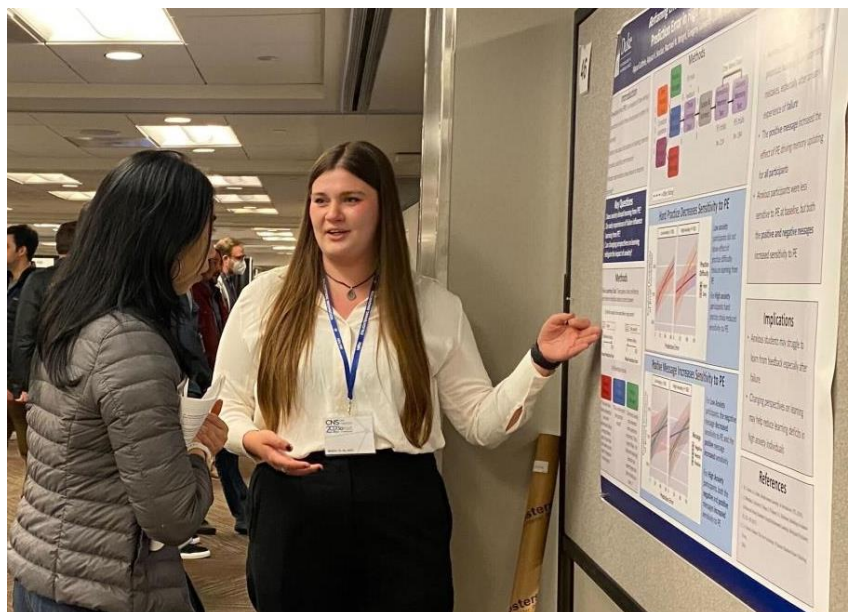
The interns' research spanned a variety of topics including:

- Neural mechanisms of song learning in zebra finches
- How curiosity influences information processing and interactions
- Aging, attention and the brain
- The neurocognitive impact of attention on conscious visual perception and moral responsibility

Since its inception, the CNRI internship has helped undergraduates obtain future research positions in labs inside and outside of our neuroscience community. Many CNRI alumni graduate from Duke and transition into research careers in industry.

The CNRI program, inspired, created and led by our graduate students and postdoctoral fellows, is not only designed to serve the undergraduates but also provides professional development opportunities for the graduate students mentoring. This year, CNRI received one of [nine awards](#) from the Graduate School, to bolster DIBS's efforts to provide comprehensive mentorship training for graduate students involved in CNRI (and DUNE). Participation in training experiences like CNRI and DUNE over their academic journey provides graduate students and other trainees with the valuable skills of mentorship, conflict resolution, communication, organization, time management, and leadership.

The Duke Institute for Brain Sciences is committed to continuing programs like CNRI to provide graduate trainees in neuroscience with multiple didactic and experiential opportunities to develop their mentorship portfolio.



Duke University Neuroscience Experience (DUNE)

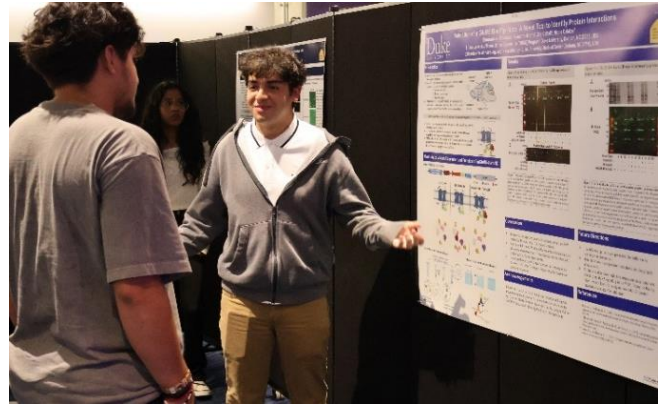
A cohort of six local **high school students** were selected from a pool of 198 applicants, signaling growing awareness and interest in the program and field of neuroscience at Duke. This transformational program for local high school students has graduated 24 DUNE students since its inception in the summer of 2021.

In addition to professional development workshops for college readiness, a neuroscience fundamentals curriculum and career pathways, scholars received paid research intern experience in Duke Neuroscience labs.

This year in the lab, scholars studied topics such as:

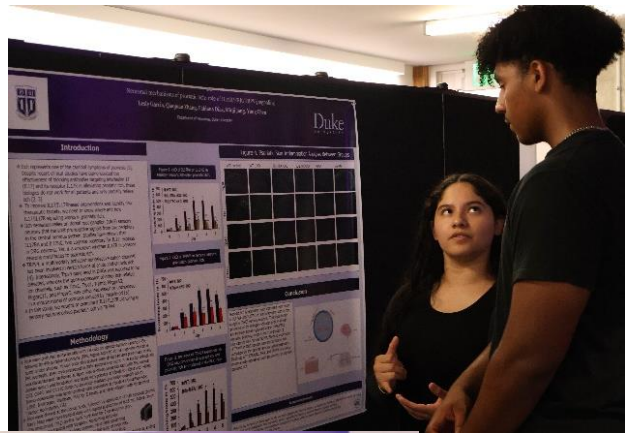
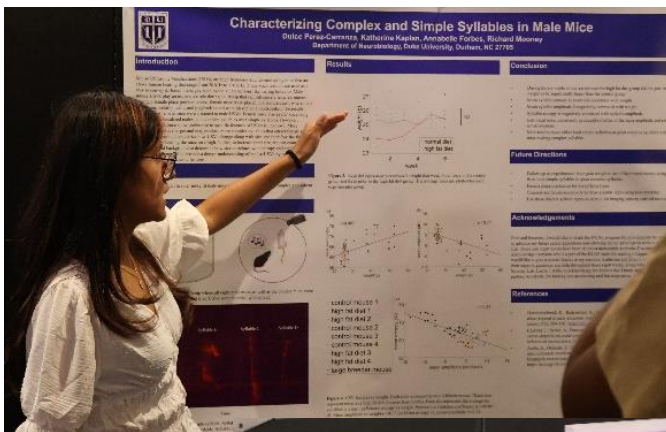
- Depression in mice
- Birdsong and human speech that motivate practice & performance
- Origins of psoriatic itch

The students presented their research in a poster session where the Duke Neuroscience community and the students' family and friends were enlightened with their contributions to the field of neuroscience.



This year, the DUNE team of neuroscience graduate students and postdocs will continue to build the program to welcome students into our scientific environment and make research opportunities more accessible to underrepresented students in the sciences. They will grow recruitment efforts and develop ways to remain connected with DUNE Alumni, mentoring the interns after the summer experience. The program will be expanded carefully to retain the exemplary, enriching experience that DUNE has delivered since 2020.

The Duke Institute for Brain Sciences and the DUNE team would like to acknowledge and thank our board member, George Lamb III (T'75, P'21), who has generously funded this transformational program.



Growing awareness and engagement to expand our community

We worked to increase awareness of our work and mission in the ultimate goal of increasing engagement by the Duke community, on campus and alumni. To do this, we:

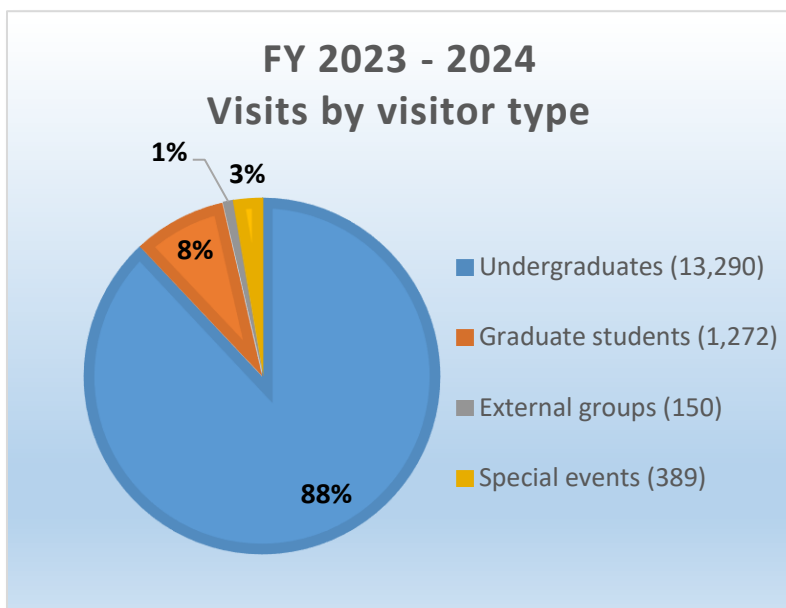
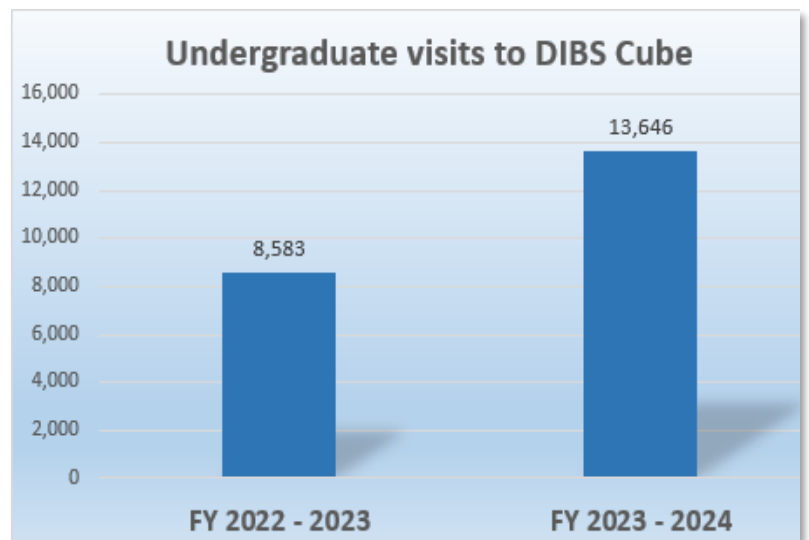
- 1) **Increased visitation and utilization of our space**, the Cube, by the Duke community
- 2) **Promoted brain science at Duke in media stories** with the help of the Duke Communications team and Duke Magazine
- 3) **Redesigned our website** to more clearly communicate what we do and why to raise awareness and excitement of site visitors
- 4) **Developed a plan to take our Institute on the road** to meet with Duke Alumni to raise awareness, interest and passion about our work in our alumni community.

1) Increased visits and utilization of the Cube

People came to the Cube for classes, neuroscience lab work, meetings, conferences, colloquiums, workshops and to study.

Increased events scheduled in the space and more classes with their students brought a buzz of excitement and passion to our space.

The DIBS Cube hosted 13,646 undergraduate visits in FY 2023 - 2024 last year, **increasing 59% from the previous year.**

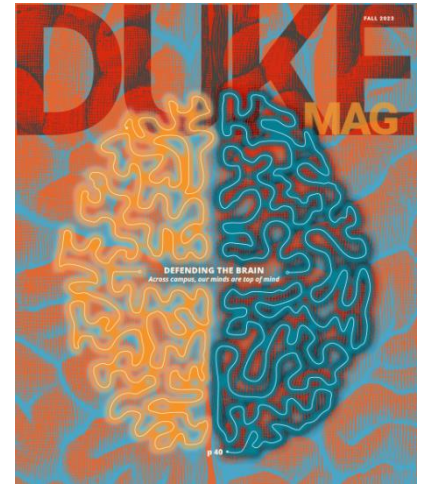


Visitors have represented all members of the Duke Community and beyond. Many of these visitors came to the Cube multiple times for classes and meetings over the year for a total of **over 15,000 visits.**

2) Promoted Duke Brain Science in media stories

Among the many stories and news pieces we produced to promote Duke's brain sciences, we collaborated on a special issue of Duke Magazine focused on brain science. This September 2023 issue entitled "Defending the Brain", featured the following articles highlighting the Institute's work, faculty and students. Read here:

- [Defending the Brain](#)
- [Building better tools to decode speech](#)
- [Could psychedelics be the answer?](#)
- [Triggering motivational thoughts](#)
- [Improving communication after strokes](#)



3) Redesigned our website to better communicate what we do and why

In order to achieve increased awareness, passion and support within the Duke community and beyond, we optimized our website's visitor experience with a total website redesign.

Our objectives were to:

- **Communicate at first glance** what we do and why
- **Bring our work to life** with engaging video footage of brain scans, classes and students holding and examining human brains
- **Streamline the navigation** to help visitors navigate the site more intuitively and effectively




4) Introduced Duke Brain Science to alumni in their hometown

In order to raise awareness and passion within the Duke Alumni community, we worked with Alumni Engagement to develop a pilot event in Chicago. A large number of the Duke Neuroscience community was in Chicago for a conference, so it was the perfect time to introduce them to Duke Chicago alumni.

The alumni were thrilled to speak with the experts in person and the researchers enjoyed sharing their work. We plan to hold more of these events in cities hosting brain-related conferences



Alumni were able to personally try an Augmented Reality experience of Brain Imaging using their phones. This technology is the type of interactivity the Brain Portal will offer.



Diffusion Tensor Imaging of the Brain AR Experience by YOLDAS LAB.

Step 1: Open your smartphone's camera and scan the QR code to visit the webpage. Make sure your browser is set to allow camera access.

Step 2: Tap 'Allow' on each pop-up option.

Step 3: Point your phone at a surface on your screen to access the 'Diffusion Tension Imaging' of the brain. The object can appear in any position. If you don't see it immediately, try moving your smartphone slightly further away and rotating it at different angles.

You can use your fingers to resize the object and place it in your desired location.

ENJOY!

YOLDAS LAB.



Our generous supporters

Our External Advisory Board

We are grateful for our External Advisory Board's generosity in expertise, time and financial support. They care deeply about the Institute's mission and programs, and their advocacy and dedication are vital to the Institute's success.

Chip Newton, Chair	
Jim Barrett	A.B.'81
Scott Barton	A.B.'87, P'17
Alice Hunter Bender	A.B.'85, M.B.A.'89, P'18, P'21
Stacey Coulter	A.B.'83
Jack Dale	B.S.'07
Andrew Feinberg	B.S.E.'90, P'22
Alex Geier	A.B.'85, P'28
Bethann Brill Horey	B.S.'84, P'18
Kyra Hoskin	B.S.'23
George Lamb	A.B.'75, P'21
Caroline Leventhal Martinez	B.S.'96
Bob Penn (emeritus)	A.B.'74, P'05, P'11, P'19
Harry Stylli	P'17
Sonya Wakil	B.S.'79, P'18

We would also like to give a special thank you to the following generous donors:

- **Ron and Beth Ostrow** who have made the Portal project possible. The Ostrows have also provided support to enhance our CNRI undergraduate internship program.
- **Mike and Jennifer Shannon**, parents of Neuroscience major Sara Rose Shannon '23, whose generosity to Duke's Neuroscience program has enabled us to develop our state of the art Neuroscience lab for students.
- **Our Anonymous donors**

Thank you to everyone who supports with gifts as well as their time and passion. We are grateful to have your support.

Resources

For more information on our programs, please visit the following web pages and news articles:

- **[Brain Portal](#)**
 - [Bass Connections: Brain Portal, Designing Multimedia Displays for Duke Neuroscience \(2024 – 2025\)](#)
- **[Duke University Neuroscience Experience \(DUNE\)](#)**
 - WUNC radio story: [Trading Backpacks for Lab Coats: High School Students Become Neuroscientists at Duke](#)
- **[Cognitive Neuroscience Research Internship \(CNRI\)](#)**
 - [DIBS Awarded Grant to Support Student Neuroscience Research Opportunities, Mentoring. Funds will help support mentor training for graduate students involved in DIBS research internship program.](#)
- **[Impact Neuroscience Program](#)**